Vol. 21. No. 9 SEPTEMBER, 1923

THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

Entered as second class matter February 10, 1903, at the post office at New York under the Act of 1879.

A MONTHLY PUBLICATION RELATING TO THE METAL AND PLATING TRADES

SUBSCRIPTION PRICE PER YEAR, UNITED STATES AND CANADA, ONE DOLLAR; OTHER COUNTRIES, TWO DOLLARS. THE METAL INDUSTRY PUBLISHING COMPANY, 99 JOHN STREET, NEW YORK, U. S. A.

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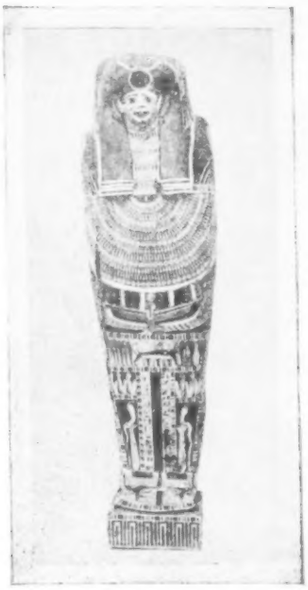
Lacquering — *an art that was never lost*



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VOL. 21 NEW YORK, SEPTEMBER, 1923 No. 9

Brass vs. Iron Foundries

The Difference Between Ferrous and Non-Ferrous Metals, The Care of Crucibles and Brass Foundry Practice*

By CHARLES F. HOPKINS
Works Manager, The Ajax Metal Company, Philadelphia, Pa.

It is characteristic of iron foundries to speak of their product in terms of tons, while the brass foundries always use the word pounds. These terms indicate very clearly the difference in the quantity produced by these two branches of the casting industry.

On price alone, non-ferrous castings would never be used, ranging from 14 to 20 cents a pound as against about 1.5 cent for pig iron. The properties of cast iron which make it the metal par excellence for many purposes are its high compressive strength, rigidity and the facility with which it can be cast and machined. In these properties it far exceeds the brass and bronze mixtures. However, cast iron often fails to meet demands because of its low tensile strength, brittleness, rapidity of corrosion and poor anti-frictional qualities. In such cases, one or another of the non-ferrous alloys are selected, depending upon the particular quality desired.

A fundamental difference between the virgin metals used in iron and brass foundries is that, whereas pig iron is delivered to the foundry practically ready for use, those metals which go to make non-ferrous alloys are delivered separately and must be combined in the right proportions and by the correct methods, to meet the various requirements.

NUMEROUS METALLIC ALLOYS

In the non-ferrous foundry, copper is the predominating element but to give the desired properties to the castings, lead, tin and zinc are usually added in varying proportions, and in many cases small quantities of iron, nickel, manganese, aluminum and phosphorus are introduced to develop peculiarities which are essential for certain purposes. The number of distinctive mixtures employed in the production of non-ferrous castings is legion.

The American Society for Testing Materials has attempted to formulate a logical and scientific classification of these alloys. Dr. Campbell of Columbia, who is chairman of the committee, says that the subject is one of some difficulty and presents a list of well-known mixtures to substantiate his statement. This list contains 799 formulæ for the production of copper base castings in Brass Foundries. These formulæ are divided as follows:

275 brass, i. e., copper with zinc as the principal alloying metal.
260 bronze, i. e, copper with tin as the principal alloying metal.
165 nickel silver, i. e., copper with nickel as the principal alloying metal.
49 aluminum bronze, i. e., copper with aluminum as the principal alloying metal.
50 manganese bronze, i. e., copper with manganese or manganese and zinc as the principal alloying metals.

It is not my desire to add to the doctor's difficulties, but in checking up the list I noticed that several formulæ were omitted from which Ajax makes millions of pounds annually. The Society has presented several tentative specifications with the object of reducing the number of formulæ and establishing standard mixtures for specified purposes. These specifications are being gradually accepted.

SCRAP COMPLICATIONS

Were it possible to make castings entirely of virgin metals, the matter would be comparatively simple, but the situation is complicated by the necessity of using scrap, of which there are two general classes, viz.: "domestic" and "foreign."

Domestic scrap is produced in every foundry in the form of gates, defectives, and spillings. In both iron and brass foundries the gates and defectives are easily re-run because their contents are known and it is only a matter of keeping the various formulæ separate. With the spillings, I understand that in the iron foundry they are collected, the iron is removed from foreign matter by means of magnetic separation and the recovery charged at the end of each heat. In the brass foundry the situation is quite different, because of the number of mixtures run and the fact that the spillings are non-magnetic.

Foreign scrap, i. e., that which is obtained from outside sources, requires judgment in its use. Foreign scrap used in a brass foundry is difficult to handle, as it may contain one or a dozen of the 799 mixtures to which reference has been made. It is the bane of the brass founder, because

*Abstracted from a recent address before the Philadelphia Foundrymen's Association. Published for the first time in THE METAL INDUSTRY.

the elements it often contains will produce bad castings, and yet the majority of foundries do not possess the means for determining which lot of scrap is best suited for any particular purpose. For this reason many brass founders have abandoned the use of foreign scrap, preferring to buy it in ingot form from refiners who are able to state its contents.

The American Foundrymen's Association has adopted specifications for foreign scrap, but I am unable to state how the plan is working out. The National Association of Waste Material Dealers has also done similar work for both cast iron and non-ferrous scrap, with the object of standardizing the different grades. These specifications, while answering the purpose of general guides, are not sufficiently definite to enable the brass founder to use them as a basis for making mixtures, except on the broadest lines.

METAL MELTING EQUIPMENT

The melting points of the elements entering into non-ferrous alloys have a wide range, phosphorus melting at 111 degrees F., nickel being at the other end of the scale with 2,650 degrees F. Most of the elements oxidize rapidly while melting and continue to do while pouring.

There is no one furnace in general use for melting non-ferrous alloys. Up to about 30 years ago the common practice was to melt them in the pit furnace, in which crucibles contained the metal and coke or coal supplied the heat, though there were a few reverberatory furnaces used when large castings were to be made. Later oil and gas to some extent took the place of coke and coal as fuel. Open flame furnaces, in which the metal is charged into a melting chamber and an oil or gas flame is directed toward it are quite common.

Because of the strong tendency of non-ferrous metals to oxidize and to pick up sulphur from the fuels used, many attempts have been made to use electric current for heating purposes. Dr. Gillett, of the Bureau of Mines, has written two bulletins on brass furnaces—the first containing 300 pages, treats of crucible and open flame types, while the second, containing 334 pages, describes eighty different electric furnaces which have been used, tried, or suggested for melting non-ferrous alloys. Much benefit can be derived from the perusal of these books.

Attempts have been made to determine what percentage of each kind of furnace is used for the production of non-ferrous castings, but with negative results. One crucible maker states that his business has fallen off, though he has not classified this decrease as between rolling mills and foundries. A second maker informs me that he is working to capacity and is behind on his orders, while a third has doubled his capacity in the past two years and expects to make further increases during 1923.

One concern producing over 100,000 pounds of red brass castings per day, uses crucibles exclusively and has so far resisted the overtures of open flame and electric furnace builders toward making a change. Other concerns producing only a few thousand pounds of castings per day, have adopted one or the other of these newer types.

The electric furnace will undoubtedly supersede all others in the years to come, because the metal losses are less, the temperature control is better, contamination by sulphur is avoided and occlusion of gases by the melted metal is eliminated. However, I believe that crucibles will melt a large part of the non-ferrous alloys in brass foundries till the economics of the electric are better understood and its cost of installation approaches closer to that of pit furnaces.

	MELTING POINT °F	SPECIFIC HEAT WATER AT 1.000	LATENT HEAT OF FUSION B.T.U	THERMAL CONDUC-TIVITY SILVER 1.000	COMPRESSION STRENGTH LBS. PER SQ. IN.	TENSILE STRENGTH LBS. PER SQ. IN.	ELASTIC LIMIT LBS. PER SQ. IN.	ELONGATION PER CENT IN 2 INS.	REDUCTION IN AREA PER CENT	PRICES APRIL 5TH CENTS PER LB
CAST IRON FROM	1900	.1298	40	.359	80000	13000	CLOSE TO	FOR PRACTICAL	FOR PRACTICAL	1.44
CAST IRON TO	2200	.1390	60	.397	112000	18000	TENSILE STRENGTH	PURPOSES NONE	PURPOSES NONE	1.58
RED BRASS						22000	16000	15.00	16.00	
CU-85. PB-5. SN-5. ZN-5	1780	.0900			18000	32000	20000	30.00	35.50	
PLASTIC BRONZE	1800	.0772			16000	20000	15000	14.00	12.00	
CU-70. PB-25. SN-5						22000	18000	19.00	18.00	
PHOSPHOR BRONZE	1700	.0848			31000	25000	15000	14.00	12.50	
CU-79.30. PB-10. SN-10. P-.7						35000	18000	18.00	18.50	
YELLOW BRASS						29000	9000	32.00	33.00	14.26
CU-67. ZN-33	1645	.0947				40000	18000	46.00	38.00	
					28000	60000	29000	15.00	12.00	
MANGANESE BRONZE	1600	.0954			46000	85000	49000	27.00	28.00	
GOVERNMENT BRONZE		.0912			25000	30000	17000	20.00	20.00	2027
CU-88. SN-10. ZN-2.	1825					35000	27000	27.00	34.00	
COPPER	1929	.0951	77	.811						
LEAD	621	.0314	10	.287						
TIN	450	.0562	25	.412						
ZINC	786	.0956	50	.625						

PLATE 1. COMPARATIVE DATA ON IRON AND BRASS

STORING, DRYING AND ANNEALING CRUCIBLES

I have visited many brass foundries and one of the things which is sometimes in evidence is the lack of proper handling of crucibles from the time they are received till they are put out of commission by misuse.

Take for example the proper storage, drying and annealing of crucibles. Due to war conditions, the Ajax yearly crucible expense, which in 1914 was about $25,000 —had in 1918 mounted to $120,000. The average heats per crucible had dropped from 30 to 14 and advancing prices made up the balance. We had at the time what we considered was a good annealing oven, but a close study showed that it might be improved. A plan was decided upon and a new oven rushed to completion, with the result that within three months the average life of the crucibles went from 14 to 21 heats, thus effecting a gross annual saving of $39,000. The oven cost about $3,500, and the fuel bill the first year was $1,200, making a net saving of a little over $35,000. We have continued to operate the oven with very gratifying results, the average heats per crucible now being 55. We do not claim that this great increase in the life of the crucibles is entirely due to the oven, because the quality of the crucibles today is much better than before the war, but we are satisfied that the use of the oven adds 25 per cent to the number of heats obtained.

Take another example in which the furnaces and crucibles were the same, but proper care was not given the crucibles. A concern which had purchased some of our furnaces and had, after their installation, continued to buy crucibles from us, complained that the crucibles were so poor that their plant was unable to maintain production. We wrote inquiring about their oven and they state it was all right but that the crucibles scalped, cracked and leaked to such an extent that their average life was only six heats.

We suggested that they return for examination some of the crucibles which had failed and also some new ones that we might test them out in our plant. The old crucibles were about as bad a looking lot as I ever saw, but an examination of the twenty-three new ones returned for test, showed that fifteen of them were pre-war stock—the real Ceylon graphite and German clay kind.

We put them through our oven, giving them special attention and thereafter used them in our regular way, with the result that the average heats obtained per crucible was 36, the old stock having an average of 39.7 and the war stock 29 heats per crucible. The result of this test determined us to make an investigation of the trouble at the source.

The concern was located in a region where fuel was cheap and, as they always carried steam, they had steam-heated a room which was constructed of wood. The wood had shrunk and the steam pipes were leaking live steam, while the temperature of the room was only 180 degrees F. The crucibles were nicely arranged on open racks so that the moist, cool air had all the chance in the world to get in its work. These facts were pointed out and our oven described to them. They sent a man to examine it, we supplied them a print, they put up an oven similar to ours and the trouble ceased.

I cite this case because it was as bad as any which has come under my observation.

In some foundries it is the practice to stack the crucibles on the top of core-ovens, furnace flues, or other warm places, while in others they are stored any old place. I have seen them stacked in part of the coke shed, the first layer standing on the dirt floor. When annealing, a common practice is to set new crucibles which are to be used the next day, on top of the furnaces after the heats for the day have been pulled. This procedure is all wrong. Whenever I see this done to a No. 70 crucible, I can visualize a hard earned two-dollar bill going up the stack. But even if the storing, drying and annealing is correctly done, the story is only partly told, because the life of any crucible is determined more by the number of hours it is in use, than by the number of heats run.

TREATMENT OF CRUCIBLES IN THE FURNACE

It behooves the brass founder then, to get his heats out in the least possible time and to do this he must get a battery of furnaces which will heat quickly. In many of the foundries I have visited, the furnaces are in a row and all connected to a single horizontal flue with a stack, either in the center, or at one end of the flue. With such a layout, each time one furnace is opened, the draft of all the others is reduced. To avoid this trouble, each furnace should theoretically have an individual stack. Where this is not feasible, the number of furnaces per stack should be limited to two.

To obtain quick acting furnaces, the design must be right. First decide upon the fuel and draft to be used; then the ratios of the bilge to the crucible to the inside diameter of the furnace, fuel space to the metal to be melted, grate area to area of furnace flue, grate area to stack area and diameter of stack to its height, must be determined.

On Plate 2, Figure 1, a cross-section of such furnaces is shown, using coke and natural draft. This design has two furnaces per stack and with a battery of eight furnaces I once took out 52 heats of 180 pounds each in a ten-hour day. The average day's run was from 45 to 48 heats. To accomplish this the covers, flues and stacks must be tight and the furnace linings maintained in good shape.

If the furnace lining is run till it gets in such shape as shown on Plate 2, Figure 2, the furnace will be slower, at the same time requiring more fuel. This design of pit furnace will melt three pounds of metal per pound of fuel. Many pit furnaces can make only three heats of the above-size per day, while the fuel consumption is usually about one pound for each two pounds of metal melted. I have come across several foundries where the fuel consumed was pound for pound to the metal melted and in one case the owner admitted to two pounds of fuel per pound of melted metal. These conditions mean a large investment in equipment, waste of fuel and reduction in the number of heats per crucible.

Let us assume that the crucibles are properly stored, dried and annealed and that the right kind of furnaces are provided. This will give the crucibles a fair start. But from now on they are at the tender mercies of the furnace men and the equipment provided for handling them. Much damage is done to crucibles through wrong tongs and carrying shanks.

On Plate 3, Figure 1, is shown two pair of tongs in position for pulling a heat.

The tongs shown in dotted lines have prongs for gripping the crucible, are the wrong shape at A and depend upon a link B for securing tension on the crucible. Their defects are as follows: The prongs are not of sufficient area to distribute the pressure on the crucible, the shape at A is such that should they be placed too low on the crucible, the tongs will grip the top of the crucible, breaking pieces out of it and make it the shape shown in Figure 2, with the resultant crack. The link at B is often driven down so hard as to put more pressure on the crucible than is necessary for lifting it out. The tongs shown in solid lines on Figure 1 have spade-shaped prongs which fit the crucible and grip it only below the bilge, the area of the spades being sufficient to distribute the pressure.

The tongs are so shaped at A that they can never grip the crucible at the top, and answer as a guide to insure their being in place. The pressure necessary for lifting is obtained from the lifting tackle through the ring and links on the handles. These tongs work on the principle of ice tongs and will always exert the pressure required to pull the crucible.

For handling empty crucibles, hot or cold, the tongs shown in Figure 3 are provided and are so constructed that the crucible is gripped below the top, thus saving breakage. A third pair of tongs (Figure 4) is provided for charging pieces of metal into the crucible. The pulling tongs (Figure 1) are apt to be sprung through use, and to restore them to shape, an iron form (Figure 5) is provided which is the size and shape of the crucible. To restore the tongs, place them in the furnace till they are hot, transfer them to the form, secure the handles at the right distance apart and hammer the tongs into shape about the form.

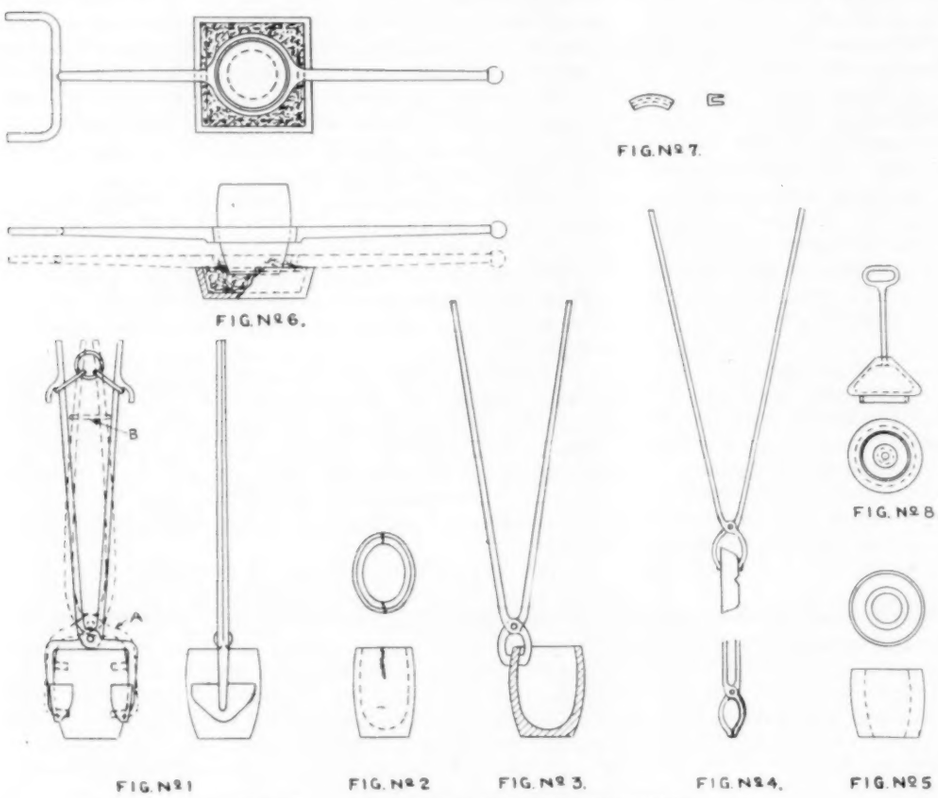

PLATE 3. CRUCIBLE HANDLING EQUIPMENT

It is necessary to handle crucibles of metal quickly. To this end some sort of a lifting device is required. A simple way to do this is to have a track running over the center of the furnaces and leading to some convenient place for the shank location. A iron block and fall with chain answers very well for crucibles up to No. 100. For the larger sizes a chain block or air hoist may be used.

The crucible is lifted from the furnace, run along the track to the shank and set in place with the lip in the right position (Figure 6). As soon as the metal is to the right heat, skim, lift shank to position on crucible and pour.

The form used for shaping up the lifting tongs is also used for keeping the shank in condition. When the crucible wears small, a couple of clips (Figure 7) may be placed on the bale of the shank to insure the crucible being in the right position for pouring the metal.

When charging metal into the crucible it should never be dropped in, but placed carefully with the tongs provided for the purpose, as crucibles are sometimes broken by dropping heavy pieces into them or placing pieces in such a way that they will constitute a wedge and thus start a crack.

INSUFFICIENT ASSISTANCE FROM EQUIPMENT MANUFACTURERS

I have cited cases of the abuse of crucibles and tried to show one way in which the trouble may be overcome.

I hold no brief for the crucible makers, for I believe that insofar as proper storage, drying and annealing of crucibles is concerned, they who possess the better knowledge of their nature, should disseminate this knowledge for the benefit of the foundrymen, and this I do not consider is being done to any great extent. They produce good crucibles and let it go at that.

Neither are the producers of foundry equipment doing their best by the foundrymen. Much of the stuff they turn out will get by after a fashion, but if the foundryman wants the best, he is often forced to design and build the tools himself.

Fortunately for the foundryman, he is in the majority of cases able to do this.

It is not my intention, in citing bad cases in regard to the treatment of crucibles, to convey the idea that we are all doing it, because such is not the fact.

A very large majority of the brass founders give considerable attention to their crucibles and many of them have practice equal in every way to that which has been described.

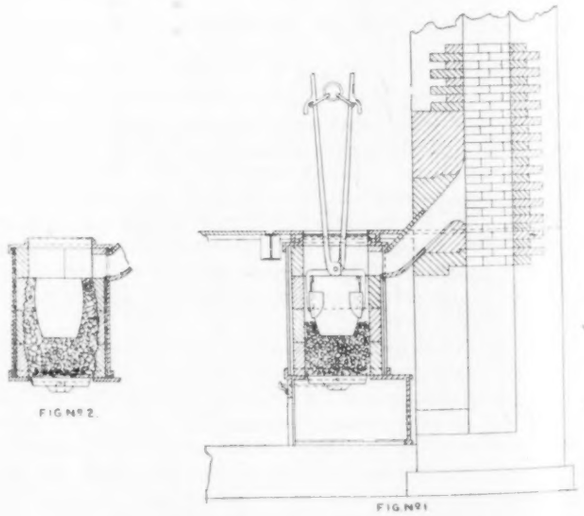

PLATE 2. BRASS MELTING FURNACE

ALLOYING AND FLUXING

The subject of producing the desired kind of alloy is the most important one with which the brass founder has to contend. The melting points of the different metals and their tendency to oxidation must be kept constantly in mind to the end that the losses will be as low as possible. Dr. Gillett has furnished a list of 107 foundries producing low zinc mixtures in which the gross losses run from 1.3 to 10 per cent and 35 producing high zinc mixtures showing losses of from 2.4 to 15 per cent. It would seem from these figures that much could be done in some of the foundries making these reports.

It is quite possible that some have slow working furnaces, charge the metals in the wrong sequence, fail to use sufficient flux, or that careless furnace men spill the metal. This is a subject upon which each founder must dig in for himself and correct any bad practice.

There are many fluxes on the market, some to do one thing or another but most of them to remove foreign substances, make clean running metal and sound castings. We have tried many, with, on the whole, rather indifferent results.

Our last experiment was with one supposed to remove free iron up to 4 per cent. Two heats of turnings iron free, to which 4 per cent of iron turnings were added, gave the following results:

Heat run with charcoal flux analyzed, Fe....1.62%
Heat run with purchased flux analyzed, Fe..1.72%

We wrote for further instructions on the use of this flux about a month ago, but have received as yet no reply which is of any value to us.

GATING, MOLDING AND POURING

Very little difficulty is experienced in producing cores and molds in the brass foundry, providing the patterns are workable.

Right here I want to state that no man is fit to design a casting till he has served six or eight years under special instruction as a core-maker, molder and pattern-maker. The things which are sent to most foundries under the name of patterns and from which molds and castings are to be made, are responsible for much profanity and many gray hairs.

In the matter of specific heat, non-ferrous metals are much lower than cast iron, while in thermal conductivity the reverse is the case. In short, the non-ferrous metals when poured have less heat to give off and give it off more quickly. Due to the relatively strong tendency of the non-ferrous alloys to oxidize and occlude gases, they must never be heated to temperatures greater than is necessary to produce good castings. These conditions place the brass founder between the devil and the deep sea. To overcome them, he must give special attention to both gating and pouring. When pouring, the crucible must be in exactly the right position and the stream of metal must be large enough to keep the sprue full. The pouring must be done without interruption till the mold is full, or the castings will be bad.

I happened to be in an iron foundry the other day when they were pouring off. One of the flasks had a run-out and the pouring was stopped till the run-out was fixed, when the pouring was finished. I remarked that it was hard luck, but the manager smiled and said the casting would be all right. Through curiosity I called him up later and was assured the casting was good, the manager remarking that it had a thick section. As a matter of fact the casting was eight feet long, cored out the entire length and the walls were three-quarters of an inch thick. Had these conditions existed in a brass foundry the casting mold, in all probability, would have been bad.

With the iron castings the gates are flat and wide, the metal running directly from the sprue with no attempt made to exclude dirt or oxide, the mold being cast flat.

The brass castings cannot be gated in this fashion. The runner must be of distinctive design, that the gates leading to the castings are cut at an acute angle to it and pointing in a direction opposite to the flow of the metal. The gates must be deep in proportion to their width; they are filleted at the castings and they take off above the bottom and below the top of the runner. The mold is raised at the sprue end and the metal poured as rapidly as possible till the sprue is full, the pouring speed for the balance of the metal being sufficient to keep it full. The metal flows down the bottom of the runner filling it quickly and pouring the castings at the lowest level first and the others in turn as a constant supply of metal is available. Any dirt or oxide in the metal has a tendency to rise to the top of the runner, and as the gates to the castings take the metal from below the top of the runner, reasonably clean castings may be expected. For some reason consumers seem to be particular about the appearance of non-ferrous castings and every precaution must be taken to make them true to the patterns.

The cleaning of brass castings, due to the toughness and tendency of the metal to clog emery wheels, is more difficult than cast iron.

The recovery of the metal in brass spillings, skimmings and ashes is a matter of considerable importance. There are several kinds of equipment on the market for this purpose which are supposed to do this in the individual foundry. Most of these which I have examined recover the large pieces but the material discarded by them runs from two to sometimes as high as seven per cent metal, and this is thrown away. The metal recovered represents all the mixtures run in the foundry and as a result it can be re-run only in low grade product.

In closing I may say that had I known as much about non-ferrous castings 30 years ago as I do today, I would have endeavored to get into a less troublesome business.

Copper and Brass Sand

Q.—I am employed at a foundry here, and in the small brass foundry they conduct, they have two separate troughs of sand. One is used for brass, bronze, aluminum, etc., while the other is used exclusively for copper and is called "copper sand." Now mind you all of this sand in both tubs or troughs came out of the same bin and is therefore identically the same (San Diego sand). As I have never heard of "brass" sand or "copper" sand I asked what the idea was. I was told that you could not successfully cast copper in sand which was being used for other purposes. I was told that the brass fumes and the little particles left in the sand by the brass rendered the sand unfit for copper. What about it?

A.—You hardly need our advice on such a question. In the first place all the sand comes from the same bin, so there is no difference in the sand. The only possible excuse for not using the brass sand to cast copper would be this, copper will burn the sand more readily than brass or aluminum. For casting copper an open sand is more desirable than a fine aluminum sand, and has more tendency to scab the brass fumes. The little particles left in the sand have no bearing on the casting of copper whatever.

We are rather inclined to believe that the objection to casting copper in the brass and aluminum trough is due to the fineness of the sand. A small shovelful of a pitch core compound added to 20 parts of the fine sand will give very good results.—W. J. Reardon.

Bronze Bushings

Various Methods of Molding These Castings*

Written for The Metal Industry by R. E. SEARCH, Exchange Editor

Hollow bushings or cylinders of bronze of various diameters and lengths are often obtained in the shape of tubes or short pipes. According to the relation of the diameter to the length, these sockets assume different names, such as tubes, casings, sleeves, collars, etc. They may be molded horizontally (see G, Fig. 1), or vertically as at A. In the first case the mold can be made in a horizontal flask more or less inclined. The pouring gates can

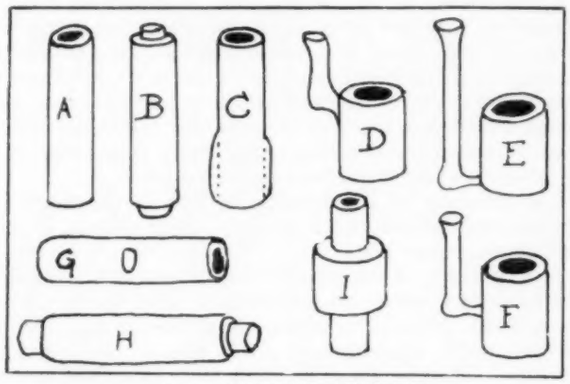

FIG. 1. VARIOUS BUSHINGS

be arranged in several ways, their form and dimensions may be varied; sometimes the gate may be placed at the end of the socket (see A, Fig. 2). It is advisable to make the pouring gate in B of an oval section; the gate should be set half in the cope and the other half in the drag. Care should be taken to avoid too much of a constriction of the gate at the point where it joins the piece that is to be cast. This is to be done in order to prevent the gate from breaking off while the casting is still hot.

The gate of the casting, A, Fig. 2, is shown parallel to the imprint of the core and extends the thickness of the socket for about 12 millimeters; the pouring head is placed between the two pieces. By this method the gate

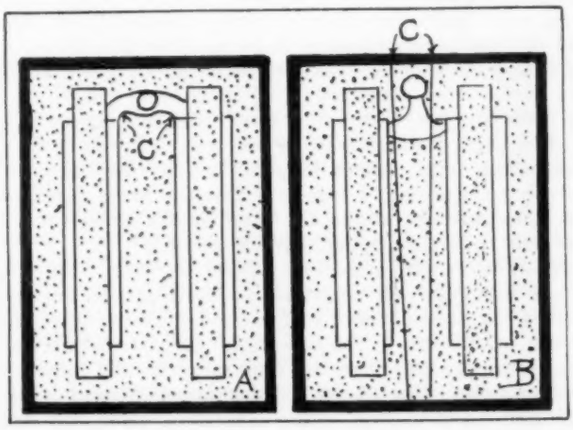

FIG. 2. METHODS OF GATING

can be broken off while the piece is still hot without damaging the casting, by this means a saving is effected in chipping or sawing off the gates or sprue-heads. A smart, quick blow with a light hammer applied at the end of the gate or near the piece breaks the gate. The rupture is then produced at the angle C shown in the figure. The small spur or projection left is removed by grinding, or if unusually small it may be chiselled off.

Sometimes the feeding head is placed in the middle of the mold (see G, Fig. 1) or under the imprint of the core (see Fig. 4). The last arrangement is used in the case of molding aluminum bronze or of manganese bronze castings, because the liquid metal is introduced at the lowest part of the mold and then it produces less dross from the resulting agitation of the molten metal.

The sockets molded vertically may be gated at the top

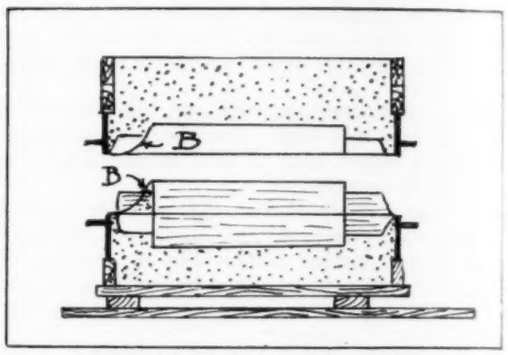

FIG. 3. DIFFICULTIES WITH A ONE-PIECE PATTERN

of the mold (see D, Fig. 1), or at its base (see E, Fig. 1); sometimes the gate is arranged at the top of the mold in the form of a circular channel, U-shaped, pierced at the bottom with small holes which pass directly through the thickness of the piece; in that case the liquid metal falls in a shower into the mold.

When it is a case of a large jacket for a cylinder, the metal can be introduced either from the top or from the bottom; in the latter case it is necessary for the metal to flow simultaneously from many points; in default of this precaution, it will be found as a rule that the casting is porous. For a long cylinder either method has its possible dangers and decision as to the choice of gating

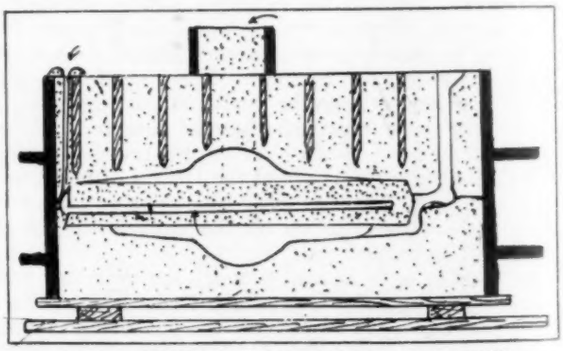

FIG. 4. FEEDING HEAD UNDER CORE PRINT

should be made only after a careful study of the particular case accompanied by mature reflection.

Thus the casting of Fig. 2, which gives good results for cylinders, straight and level, would be likely to cause serious mistakes if used for the shape marked, I, Fig. 1, because the side walls would be fed by the sufficiently thick section of the center, which would act as a feeding

*Abstracted from La Fonderie Moderne of April, 1923, pp. 111-13.

head to its own utter destruction. A piece of that kind should have its feeding head provided for at the center, and use the arrangement shown in Fig. 4.

Figure 4 shows a fitting for a ball and socket joint, for ordinary running upon electric machines. The spherical enlargement at the center requires particular care; if it is not sufficiently fed the lack of metal produces a cavity with a flat space at the top of the spherical part. A feeding or so-called "lost head" of 75 millimeters is provided and joined to the sphere by an oval channel 38 millimeters wide by 56 millimeters high at the level of the mold and restricted at the point of contact with the sphere. This feeding head is extended 15 centimeters above the mold in order to put the sphere under pressure. The casting is made as indicated.

When the mold is filled up to the level of the pouring hole, the metal is covered with sand and covered with a weight, then the pouring is continued, gently, into the feeding head until the opening will take no more metal. This method strains the mold less than if the pouring hole and feeding head were on the same level, the feeding head being fed by the pressure from the pouring head.

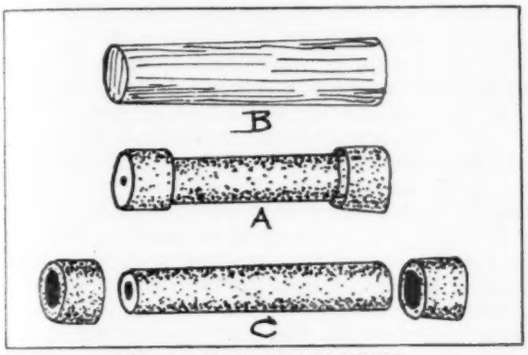

FIG. 5. CORE FOR BUSHING

The fittings of the pattern for Fig. 4 are of variable dimensions, sometimes many patterns can be set in a flask, at other times the mold is made in clay or loam. The figure represents a large pattern. The opening of the feeding head under the core gives better results than when it is made on the joint or parting line of the mold. See A or B, Fig. 2. In the arrangement B of Fig. 2, the molten metal strikes the core, or it gushes out upon the mold, with a force that green sand does not resist; particles of sand are detached or eroded and are carried away to the upper part and thus form soft spots or scabs of some kind that are detrimental to the casting.

The arrangement D, of Fig. 1, at the top of the piece is suitable for a short socket, poured vertically; molders would employ it generally when it can be done because of its economy. The arrangement F, of Fig. 1, does not present any marked advantage for the molding of connected pieces, it is, on the other hand, recommended for pieces having the form of the casting shown at I. This lowers the height of the fall of the metal and supplies the piece in its heaviest portion. It is to be observed that if the mold of the piece, I, is poured vertically, it should be separated from the level of the upper piece at the upper edge of the enlargement; if this were not done it would be impossible to remove the pattern; pouring from this level does not affect the cost of producing the casting.

When it is a question of pouring a socket with a length much greater than its diameter, like the shape, H, of Fig. 1, as to whether it should be done vertically or horizontally, the choice of the method should generally be left to the molder. The composition of the alloy must also be considered as some bronzes have a tendency to liquate much more than others, and in that case the thickness of the wall section of the casting must be considered. It is known that for patterns which are to be cast vertically the pattern is made slightly conical so that it will readily draw from the sand, like B, for example; for a cylinder like H, the pattern is made so as to be molded horizontally. If the pattern is not fixed subject to the intentions of the molder in these respects, the pattern may be made of movable parts, so that the piece may be exactly cylindrical or with a conical draft, and thus be adjustable.

Fig. 3 shows an irregularity frequent in green-sand molding of a socket when the pattern is in one piece. At the moment of lifting it out the sand is torn or ruptured at B, in the angle formed by the body of the socket and the imprint. This necessitates a long and careful repairing. This inconvenience is avoided by rapping the pattern with a light iron rod before the pattern is withdrawn, this action of course slightly enlarges the mold. In addition the pattern is rarely replaced in the same position in the mold that it first occupied, and it is sometimes difficult to re-center the pattern exactly when it is returned. For this reason it would result in better work if the pattern were made a "two-piece" pattern.

Another difficulty arises from the pressure which the core exerts by its bearing upon its green-sand support. For small as the pressure may be, the support may be insufficient and give way under the weight of the core, and then the mold is likely to be a waster. The same accident may occur if the imprint of the core is too short. The top is also often damaged by the crushing contact of the cope, if the core is set untrue in any way; this damage may be done sometimes by escape of metal through the vents. These accidents may be avoided by a preliminary test of the cope, which may be made by covering the ends of the core-bearings with a test mark such as may be made by a farina sizing or by a thick pat of sand.

For this purpose a little of the sand is removed from the joint under the bearing, fill with water, then replace the sand by forming a small pad at the end of the bearing. The top is then supported, then removed. The pad should be crushed. The vent should be conducted to the side of the casting and stopped by a plug of sand. From the precautions mentioned it can be seen that green-sand molding is full of many hazards.

Fig. 5 shows a more modern method and at all points superior to the older method. B represents a pattern (a simple cylinder), A represents the core. The sketch shows how it is centered and supported. The ends of the pattern, B, are slightly conical, in order to avoid tearing out the sand when the pattern is lifted out. If the core is in one place, as indicated in A, Fig. 5, it would meet the requirement. If the arrangement shown at B, Fig. 2, be adopted as the method of feeding the mold, a small circular groove can be made in the pattern at the edge of the support, this serves as a guide for the pouring. If method A, of Fig. 2, be preferred, the feed runner should be trimmed in the core and not made by the insertion of a wooden core in the core-box.

Molten Lead Cover

Lead is easily fusible, melting at about 620° F. It boils and volatilizes at a white heat. The affinity of lead for oxygen is so great that in melting the surface becomes coated with a yellow layer of oxide. On removing this layer the pure white color of the metal itself is seen, but immediately disappears again. Large quantities of lead in a short time can be converted into oxide. The flux I would suggest is composed of:

Sal ammoniac	4 parts
Sulphur	2 "
Powdered charcoal	1 "
Rosin	1 "

W. J. REARDON.

Nickel Plated Production Pattern Plates

A Method of Overcoming the Difficulty of Sand Adherence

Written for The Metal Industry by WILLIAM H. PARRY, Foundryman

If a user of production pattern plates which permit sand to cling to their surfaces when affected by atmospheric conditions, or patterns afflicted with acute angled or deep and narrow pockets will go to the expense of nickel plating these aids in the production of quantity castings, most, if not all, of his troubles will disappear. The heating of pattern plates with the object of preventing the sand from adhering to their surfaces either by torch flame directly applied, gas flames on the under side, or electric current flowing into inserted heaters, does no doubt help out, but in the event of torch or gas being used, an excess of heat will often melt the soft solder in screw head slots and other recesses that need filling up on the assembled pattern plates.

Electric heaters inserted into plates other than those of the flat variety means mighty fine workmanship which spells lots of time and great expense, to say nothing of the ever-present cost of upkeep which includes that of the current necessary to induce by resistance the amount of heat it takes to keep the whole plate warm. Possibly no electrical device uses more current in proportion to the benefits derived than the average heater, and while some foundries fortunate enough to be able to use electricity ad lib. may get away with it, the little founder is denied that privilege because of the cost.

The first step in the making of metal patterns, and a very important one, indeed, is the kind of workmanship and molding knowledge necessary to form the grand master or master patterns. Not every patternmaker's mentality and skill are such that he can handle this class of work where speed is not a factor, so that the choice of men equipped by a kind Providence to overcome the difficulties that beset the path of such mechanics, is one of the trying functions of the master patternmaker's job.

The next step, and equally important, is the selection of the molders able to make superlative castings, true to pattern, it being understood that in the making of such pattern castings, the very minimum of rapping and mold patching is allowable, the use of **any** molders' tool is not even to be hinted at. Assuming then that the resulting castings are as they ought to be, the next step is the finishing, which, if the patterns are cast integral with the plate, means little or none other than that necessary to fit same to the flask pins or holes with possibly a little touch here and there where the sand had broken away at the partings, though it has been argued that even these final touches are superfluous as the molding to follow would show the same parting difficulties and deficiencies. Where patterns are to be spaced and placed on one or both sides of a plate and the design is such that machine work is possible and sometimes preferable, all tool marks not in line with the draw must be smoothed out, and that is a stunt much easier to write about than to do.

Worst of all, conditions to be avoided in metal patternmaking is a "Pittsburgh Finish," otherwise known as a surface showing a high polish with deep scratches particularly if the scratches are across the draw. A good surface, not necessarily a polished one, either machined, scraped, filed, or emery cloth finish, but always in line with the draw on surfaces other than flat, is a good finish for all metal patterns. However, patterns with the surfaces not disturbed in any way by tooling, and with the casting skin fresh from the mold, is the best surface of all, assuming of course that a fine facing sand and a print back has been used in their making.

The use of parting compounds to prevent the sand from adhering to the patterns has much to commend it, but it also has much to answer for in the way of filling up the confined spaces such, for instance, as between lettering and in deep or shallow pockets, by the oft-repeated sprinklings. This material has many trade names, but not one is comparable to the "daddy of them all" Lycopodium, the cost and use of which is all but prohibitive on all work but pattern castings. Coating patterns with bayberry wax alone and sometimes mixed with benzine is a practice that prevails in some foundries, mostly in the Middle West, though its lasting qualities on surfaces in line with the draw, are not long lived, thus requiring rather frequent renewals when in constant use. As it is necessary to flow off all wax before applying a new coat to prevent it from building up on surfaces not in line with the draw, it becomes a rather expensive operation if good results are to be expected. So, all things considered, the use of any and all of these short cuts are to be avoided, now that a durable covering has been discovered to overcome the handicaps that prevent the rapid making of castings, through the medium of nickel plating all production metal patterns, be they made of aluminum, brass, white metal, or iron.

The point may be raised that electro plating with nickel is too expensive a proposition to consider in connection with the coating of patterns, but, when the expense of all labor is added to that of the various compounds used to facilitate—and ofttimes hinder—the rapid production of castings as against the first cost of nickel plating, experience teaches that nickel plated patterns are much the cheapest and best in the end. Critics may ask why they should nickel plate when they can be covered just as well with zinc, brass or even lead. That's where the smooth and eel-like joker slips in, as nickel is the most slippery of all reasonably priced metals used in plating, and molding sand will not adhere to it at the working temperatures found in foundries the year around.

To prove this, take two plates of the same design and temperature, one nickel coated, and one not; lay them down flat on their backs, throw a handful of compressed sand and from the same heap, on each, at about the same section, using a fair amount of force, turn them over, tap lightly and note that the nickel coated one sheds a lot more of the sand than its coatless mate. Or try this method: Ram up a mold from each plate under similar sand and temperature conditions, using parting compound on the one not nickel plated, and none on the other. Put them through the same course of sprouts, be it vibrating or rapping, prior to the "lift off" of either mold or pattern, and note that the nickel-coated plate easily holds its own, and without the help of any parting compound.

As nickel plating jobbing shops are fairly numerous in most any old town the necessity for special plating equipment for this express purpose is not advocated here. Electro plating is an art not acquired in a day.

Perhaps there are those who may object to nickel plating on the ground that the thickness added thereby, means increased weight of castings. If any such there be, the advice is offered for what it is worth: To go over the patterns once more in an effort to shave off a thickness equal to a goodly coating of nickel, which will approximate that of the extremely thin sheet that separates Los Angeles from Heaven, at least, so the residents of that section of southern California tell us.

Defective Bronze Castings

An Explanation of the Various Reasons Responsible for their Production in the Foundry and what Should be Done to Minimize and Prevent this Condition

Written for the Metal Industry by WALTER F. BUCKLEY, Brass Founder, Philadelphia, Pa.

As far back as I can remember through a period of forty years I have always been impressed by the unfavorable remarks of many buyers of bronze castings directed against foundrymen generally when they discovered one or more defective castings in a shipment. I have noticed that these critics never stop to consider that imperfect castings are not made by design. On the contrary, it is the desire of every owner of a foundry to produce the highest possible percentage of perfect castings, but in view of the fact that it is impossible for anyone to attain perfection, it is inevitable that there will always be some defective castings made in every foundry. And this state of affairs will be intensified whenever the pattern to be reproduced is of an intricate design, or when well-tried principles of foundry practice are neglected.

In view of the fact that the great majority of all the castings made in every foundry are formed in green sand molds it follows that the element of moisture has an important bearing on this subject which does not always get the amount of consideration it should have, and lack of care in this respect is one of the causes of defective castings. Facing sand that is too wet cannot in any way contribute to the production of sound castings, but the too liberal use of water in the sand is nevertheless a common error in many foundries and this alone is one of the most frequent causes of bad castings from green sand molds. Another cause is the insufficient use of the vent wire thereby preventing the escape of the steam instantly generated as a result of the contact of hot metal with the wet sand surface of the mold, another cause of defective results lies in the facing sand that is used too dry, thereby causing the hot metal to fill the casting with powdered sand. This is proof that the two extremes give the same results, namely, defective castings. Another cause of bad work is ramming the molds too hard. This causes what is termed scabbing, and this condition is manifested mostly in castings of large flat area. Still another cause is found in the poor quality of facing used due to weak binder, and the molder's difficulties are often added to by improperly made patterns. Defective results are also brought about by the use of copes that are too shallow and gates that are too small with not sufficient weight of metal behind them. Castings made under these conditions are often shrunk out of shape, and holes are found at the gate when it is cut from the casting. Castings that are made from metal that has been poured too hot are always porous if they are of a heavy and bulky type and those that are poured from metal that is too cold are likewise defective in the same manner. Another cause of defective work lies in what is termed shifted joint due to worn pin holes in the flask, and I have often seen men using flasks in which the lost motion in this respect varied from one-sixteenth of an inch to one-eighth.

During the many years in which I have been using copper, tin, lead, zinc and aluminum in making various alloys of bronze used in many different ways, I have seen large quantities of defective castings turned out, notwithstanding the fact that in many cases the metals used were of very fine quality. But high grade metals will not always develop into satisfactory castings if the melted fluid is poured into the mold too hot and the same rule applies if it is poured too cold.

The state of affairs described here does not apply to light castings but it does exist in all cases where small dimension is coupled with heavy weight. In many cases defective castings are produced even when the metal has been poured at the proper temperature. This is because the gate of casting is too small and also because the down runner through the cope is not heavy enough.

In order to conduct any brass foundry whether large or small on a plane that will be profitable to its owner it is essential that it must be in charge of a man who is a thoroughly practical molder, who has been graduated in the hard school of experience, instead of one who has acquired a theoretical learning from text books which are very often at variance with practical knowledge.

In my experience, the following methods have been attended with the most gratifying results, and I have produced as much as ten thousand pounds of bronze castings with the loss of only one pound in the foundry and, none rejected by the customer who received them. It consists of placing larger gates in every instance than is usually done, irrespective of the weight of the casting. Deep copes are used on all work and down-runners of large diameter are always in evidence. All castings that are over fifty pounds are subjected to forced fluid pressure feeding with one inch diameter iron rod through down runner until the metal is set.

It is known to all foundrymen that the outside of all castings set first, and when metal is poured into the mold a certain amount of gas remains secreted in the molten mass. The agitation of the metal through the medium of the feeding rod drives this gas out through the sand and finally causes solidification under considerable pressure. This treatment closes the grain and the metal has greater tensile strength. It also makes the casting heavier than it would be if allowed to cool in the ordinary way without feeding. Most important of all is the fact that this method of treatment produces a maximum amount of sound castings with a minimum of loss. There is no mystery about it whatever. It is very simple and easily understood. It is true that a larger amount of molten metal is required to produce a given quantity of castings, but it should always be remembered that the end justifies the means, and that neglect of the precaution mentioned herein is responsible for the return of many castings to the crucible.

In connection with the methods I have described, the matter of the treatment of the metal from the time it enters the crucible till it is poured into the mold is highly important, irrespective of whether the material is all new stock or part new and part old. Effective deoxidizing treatment is necessary to remove the impurities from the metal. In my own experience I have found that phosphorized copper is the best scavenging agent that I ever used, both during the melting process and after the crucible has been drawn from the furnace. The amount used must depend largely upon the nature of the service that the castings are called upon to render.

Excessive use of phosphorized copper increases the brittleness of bronze. This condition is all right in cases where the castings are subjected to compression. But when castings are required to withstand twisting or tensile stress better results can be obtained by a more moderate use of any deoxidizing agent. The temperature at which metal should be poured into any mold must depend entirely upon the size and weight of the casting and must be left to the judgment of the person in charge.

A List of Alloys

Reprinted from the Booklet Published by the American Society for Testing Materials. Part 5*

By WILLIAM CAMPBELL†

BRONZES (Continued)

PER CENT	COPPER CU	TIN SN	ZINC ZN	LEAD PB	IRON FE	OTHER ELEMENTS
Cornish	77.8	9.6	....	....	0.8	
Damascus	77.	10.5	....	12.5	....	
Damar	76.4	10.6	....	12.5	....	
Daimler Bearing	76.	3.	20.	1.	....	
Dudley's B	77.	8.	....	15.	....	
Dudley's K	77.	10.5	....	12.5	....	
Dudley's Phosphor	79.7	10.	....	9.6	0.8	
Durena	65.	2.	30.	....	....	Al, 1.5; Fe, 1.5
Dysoid	62.	10.	10.	18.	....	
Edward's Speculum	63.3	32.2	....	....	....	As, 1.6
Edward's Speculum	69.8	25.1	2.6	....	....	As, 2.4
Eisen-Bronze	82.5	8.55	4.45	....	....	Fe, 3.95
Eislers	94.1	5.9	....	....	....	
Eccentric Ring	84.	14.	2.	....	....	
File Bronze	64.4	18.	10.	7.6	....	
File Metal (Genfer)	64.4	18.	10.	7.6	....	
File Metal (Genfer)	62.	20.	10.	8.	....	
File Metal (Vogel)	73.	19.	8.	8.	....	
File Metal	61.5	31.	....	8.5	....	
File Metal	51.	28.5	7.	7.	....	
Flange Metal (German)	92.4	2.5	5.05	....	....	
Flange Metal (French)	94.35	5.6	....	0.05	....	
Gearing	91.3	8.7	....	....	....	
Gear Bronze	88.	10.	....	....	2.	
Gear Bronze	85.	13.	2.	....	....	
Gears	85.	10.	3.	2.	....	
Gun Metal	90.	10.	....	....	....	
French, Modern	90.1	9.9	....	....	....	
French, Old	89.44	8.91	1.39	0.16	....	
Prussian, Modern	90.9	9.1	....	....	....	
English, Modern	89.3	10.7	....	....	....	
English, Modern	91.74	8.26	....	....	....	
Russian, Modern	90.8	9.2	....	....	....	
Russian, 1813	88.61	10.7	....	....	....	Fe, 0.69
Swiss (Lucern)	88.93	10.37	0.42	....	....	
Cochin China	77.18	3.42	5.02	13.22	....	Fe, 1.16
Cochin China	93.19	5.43	....	....	....	Fe, 1.38
Chinese, Old	71.16	....	27.36	....	....	Fe, 1.40
Chinese, 1901	93.2	5.05	....	....	....	Fe, 1.72
Turkish, 1464	95.2	4.31	....	....	....	
Turkish, 1907	90.9	8.8	....	....	....	Fe, 0.2
Gun Mount	80.	3.	17.	....	....	
Graney Bronze (Law)	75.8	9.2	15.	....	....	
Gurney's	75.8	9.2	15.	....	....	
Hercules	85.5	10.	2.	....	....	Al, 2.5
High Temperature	90.7	2.7	6.3	1.3	....	
Hydraulic	83.0	10.8	6.0	0.1	....	
Instrument	82.	13.	5.	....	....	
Instrument	82.1	12.8	5.1	....	....	
Johnson Locomotive Bearing	87.5	7.85	5.07	....	....	
Kern's Hydraulic	78.	12.	10.	....	....	
Kochlin's Bearing	90.	10.	....	....	....	
Kuhne Phosphor Bronze	78.	10.6	....	10.45	0.57	Ni, 0.26
Lafond's Bronze	83.	15.	1.5	0.5	....	
Lafond's Axle Bearing	80.	18.	2.	....	....	
Lafond's Straps	84.	14.	2.	....	....	
Lafond's Pumps	88.	10.	2.	....	....	
Lafond's Heavy Bearing	83.	15.	1.5	0.5	....	
Lafond's Malleable	98.04	1.96	....	....	....	

* This booklet can be obtained from THE METAL INDUSTRY for $1. Parts 1, 2, 3 and 4 appeared in our issues of March, April, May and July, 1923.

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BRONZES (Continued)

	PER CENT COPPER CU	TIN SN	ZINC ZN	LEAD PB	IRON FE	OTHER ELEMENTS
Lowroff Phosphor Bronze	70.	13.	....	16.	1.	
Lowroff Phosphor Bronze	90.	4.	....	5.5	0.5	
Laderig's Speculum	69.	28.7	....	....	....	
Medal	92.	8.	....	....	....	
Medal	97.	1.	2.	....	....	
McKechnie's	57.	41.	1.	0.5	....	Fe, 1.
Manheim Gold	83.7	7.	9.3	....	....	5 per cent of Phos. Tin
Manganese Bronze	82.	8.	5.	3.	....	Mn, 2.0
Manganese Bronze	83.5	8.	5.	3.	....	Mn, 0.5
Mudge's Speculum	68.82	31.18	....	....	....	
Needle	84.5	8.	5.5	2.	....	
Nongran	87.	11.	2.	....	....	
Neogen	58.	2.	27.	....	....	Ni, 12.; Al, 0.5; Bi, 0.5
Naval Gun Metal, G	88.	10.	2.	....	....	
Naval Journal, H	83.	13.5	3.5	....	....	
Navol Journal, HX	83.	13.5	....	3.5	....	
Naval Valve, M	87.	7.	6.	....	....	
Naval Phosphor, Cast, P-c	88.	8.	2.5	....	0.5	
Naval Phosphor, Rolled, P-r	95.	4.5	....	....	0.5	
Oil Cups	85.	5.	7.	....	....	
Oil Pump	83.	3.	9.	....	3.	
Ounce Metal	85.	5.	5.	5.	....	
Ormulu	58.	16.7	23.3	....	....	
Ormulu, small	94.12	5.88	....	....	....	
Ormulu, large	90.5	6.5	3.0	....	....	
Perking Brass	76.2	23.8	....	....	....	
Perking Brass	80.	19.82	0.14	....	....	
Phosphor Bronze:						
Wire	98.75	1.2	....	....	0.05	
Hard	92.8	7.	....	....	0.2	
Very Hard	80.	9.	....	....	1.0	
Rolling	95.6	4.5	....	....	0.1	
Charpy	85.7	12.2	....	....	0.4	
Charpy	84.8	13.4	....	....	0.46	
Law	87.6	10.8	....	....	1.0	
Law	88.7	9.5	....	....	0.7	
Bridge	80.	20.	....	....	1–0.2	
Bridge	85.	15.	....	....	1.	
Bearings	83.	14.	2.	1.	1.	
Bushings	79.	10.	....	10.	0.7	
Gears	88.	10.	....	2.	0.1	
Gears	85.	13.	2.	....	0.1	
Gears	78.	12.	....	7.5	0.1	
English	79.2	10.2	....	9.6	0.97	
Pennsylvania Railroad	79.7	10.	....	9.5	0.8	
Pennsylvania Railroad "B"	76.8	8.	....	15.	0.2	
Pennsylvania Railroad "B"	85.55	9.85	3.77	0.62	0.05	
Pennsylvania Railroad "B"	80.	8.	....	10.	....	2 per cent of Phos. Tin
Russian	93.7	5.8	0.34	....	0.17	
Piston Rings	84.	2.9	8.3	4.3	....	
Piston	83.	1.	16.	....	....	
Railroad (Hughes):						
Slide valves	84.5	10.	....	5.	0.5	
Injector	84.	8.5	5.	2.5	....	
Phosphor Bronze	88.5	10.	....	....	0.5	
Axle Box Bearing	80.	5.	....	15.	....	
20-Ton Wagon	60.	5.	....	20.	....	
Railroad (Thurston):						
Axle Bearings, French	82.	10.	8.	....	....	
Axle Bearings, Common French	78.	20.	2.	....	....	
Axle Bearing, Lafond	80.	18.	2.	....	....	
Axle Bearings, Hard	87.05	7.88	5.07	....	....	
Eccentric Strap, Dutch	85.25	12.75	2.0	....	....	
Eccentric Strap, Lafond	84.	14.	2.0	....	....	
Gearing	88.8	8.5	2.7	....	....	
Locomotive Bearings	89.	2.4	7.8	....	....	Fe, 0.8
Locomotive, German	81.17	....	15.2	14.6	....	Fe, 0.9

BRONZES (Continued)

PER CENT	COPPER CU	TIN SN	ZINC ZN	LEAD PB	IRON FE	OTHER ELEMENTS
Locomotive, Durable	73.5	9.5	9.5	7.5	....	Fe, 0.5
Pistons and Rods	74.1	3.7	22.2	....	....	
Richardson's Speculum	65.3	30.	0.7	....	....	As, 2.0; Si, 2.
Roman Bronze	90.	9.	....	....	....	
Ross' Alloy	68.2	31.8	....	....	....	
Sallit's Speculum	64.6	31.3	....	....	....	Ni, 4.1
Sheet Bronze	90.	10.	....	....	....	
Sheet Phosphor	94.5	5.0	....	....	....	0.5 per cent of Phos. Tin
Sheet Phosphor	95.	4.	....	....	....	1.0 per cent of Phos. Tin
Sashchain	92.	8.	....	....	....	
Sashchain	95.	5.	....	....	....	
Screw-Nut	86.	11.4	2.3	....	....	
Slide Valve	88.5	2.5	9.	....	....	
Steam Fittings	88.	8.	2.	2.	....	
Silicon Bronze	98.55	1.45	....	....	....	Si, 0.05
Silicon Bronze	91.	9.	....	....	....	Si, 0.05
Statuary Bronze:						
Column Vendome	89.2	10.2	0.5	0.1	....	
Column of July, Paris	91.4	1.6	5.6	1.4	....	
Napoleon I, Paris	75.0	3.0	20.	2.0	....	
Henry IV, Paris	89.62	5.7	4.2	0.48	....	
Louis XIV, Paris (1699)	91.4	1.7	5.53	1.37	....	
The Shepherd, Potsdam	88.68	9.2	1.28	0.77	....	
Bacchus, Potsdam	89.34	7.5	1.63	1.21	0.18	
Germanicus, Potsdam (1820)	89.78	6.16	2.35	1.33	....	Ni, 0.27
Mars and Venus, Munich	94.12	4.77	0.3	0.67	....	Ni, 0.48
Bavaria, Munich	91.55	1.77	5.5	1.3	....	
Munich	92.88	4.18	0.44	2.31	0.15	
Munich	77.03	0.91	19.12	2.29	0.12	Ni, 0.43
Augsburg	89.43	8.17	....	1.05	0.34	Ni, 0.19
Augsburg	94.74	1.64	0.54	6.24	....	Ni, 0.71
Grosser Kurfürst, Berlin	89.09	5.82	1.64	2.62	0.13	
Frederick the Great, Berlin	88.3	1.4	9.5	0.7	....	
Melanchton, Wittenberg	89.55	2.99	7.45	....	....	
Speculum, Cu_4Sn	68.25	31.75	....	....	....	
Speculum, English	66.6	33.4	....	....	....	
Speculum, Chinese	80.8	10.7	....	....	....	Sb, 8.5
Speculum, Chinese (Elsner)	80.8	....	....	....	....	Pb, 9.1; Sb 8
Schmidt Locomotive Bearing	86.	14.	....	....	....	
Seraing Bearing	86.	14.	....	....	....	
Seraing Piston Rings	89.	2.	9.	....	....	
Stephenson, Locomotive Bearing	79.5	7.5	5.0	8.0	....	
Stephenson, Piston Rings	84.	2.9	8.3	4.3	...	Fe, 0.4
Stone's English Gear	89.	11.	....	....	....	
Telegraph Bronze	80.	5.	7.5	7.5	....	
Tungsten Bronze	90.	....	....	....	....	W, 10.
Tin Bronze	89.	11.	....	....	....	
Uchatius Bronze	92.	8.	....	....	....	
Ulcony	65.	....	....	35.	....	
Valves	85.	9.	6.	....	....	
Valve Bronze	89.	5.	3.	3.	....	
Valve Bronze	83.	4.	7.	6.	....	
Valve Steam	88.	10.	2.	....	....	
Weights	90.	8.	2.	....	....	
Whistles	80.	18.	2.	....	....	
Whistles, Lafond	81.	16.	2.	....	....	
Whistles, Lafond	80.	18.	....	....	....	Sb, 2.0
Wire	98.75	1.2	.. ....	....	0.05	

This List will be continued in an early issue.—Ed.

Electro-Plating Research

Work of the Bureau of Standards Upon Electrodeposition. July 1, 1922—June 30, 1923*

By Dr. WM. BLUM

The purposes of the studies upon electrodeposition are (a) to determine the fundamental principles, especially those which govern the structure and properties of the deposits; (b) to develop methods for the analysis and control of electroplating and electrotyping solutions; and (c) to furnish to interested Government departments, electroplaters, manufacturers, and others, information and advice. Owing to the fact that there are comparatively few persons with technical training connected with the electroplating and electrotyping industries, frequent visits to plants and lectures to appropriate groups are necessary and helpful. In addition to the contacts thus formed, the Bureau keeps in close touch with the industry through the research committee of the American Electroplaters' Society, which meets at the Bureau twice a year. An experienced electroplater, Mr. George B. Hogaboom, is employed in an advisory capacity.

The status of the principal researches is as follows:

GENERAL ELECTRODEPOSITION

(a) **Current distribution and "throwing power."** In commercial electroplating it is important to secure as nearly uniform distribution of the metal coating as possible, especially upon irregularly shaped articles. Solutions which produce good distribution are popularly designated as having good "throwing power." This property has been defined, and methods of measuring and controlling it have been devised. These experiments were made with copper solutions. A study of throwing power, in nickel deposition is in progress.

(b) **Structure of deposits.** The internal structure of electrodeposits is important, because it largely determines those properties, such as hardness, strength, ductility, luster, etc., upon which the usefulness of the coatings depends. Investigations thus far conducted, have led to the development of a tentative theory of the mechanism of metal deposition and of a simple classification of the crystal types existent in electrodeposits. Further work is required before definite recommendations can be made.

(c) **Effect of base metal structure.** It has been found that when copper is deposited upon rolled or cast copper, under certain conditions, the crystals of the electrodeposit are direct continuations of those existing in the base metal. This observation indicates the possibility of similar effects, when one metal, *e.g.* nickel or silver, is plated upon another, such as steel, brass, or nickel silver. It is hoped to investigate this subject further.

NICKEL DEPOSITION

(a) **Acidity.** Further observations have indicated the usefulness of hydrogen ion (or pH) measurements for controlling the acidity of nickel solutions both in research and practical electroplating.

(b) **Effects of impurities.** The principal metallic impurities likely to be present in nickel salts are copper, zinc, and iron. Copper was found to be most detrimental, and zinc slightly less so; while iron in moderate amounts is not usually deleterious. On the basis of this information and of an examination of a large number of samples of commercial nickel salts, tentative specifications have been prepared.

(c) **Nickel anodes.** A satisfactory technique has been developed for measuring quantitatively the corrosion efficiency of nickel anodes, *i.e.* their ability to maintain the nickel content of the solutions. Preliminary experiments have been completed, and final tests are now in progress to determine the effect of the composition, method of preparation, and structure of nickel anodes, upon their behavoir.

(d) **Conductivity.** The conductivity of solutions containing nickel sulphate and the various common constituents of nickel baths has been determined.

(e) **Deposition of nickel or zinc.** An investigation has just been started to determine the principles which govern the nickel plating of zinc and die castings. The effects of such conditions as the composition and acidity of solutions and the current density will be studied. In this connection, the Bureau, will be pleased to receive from platers information regarding methods now used for nickel plating zinc and die castings and any defects or difficulties that are encountered.

(f) **Preparation of pure nickel.** Experiments are in progress to produce on a fairly large scale nickel of very high purity suitable for the determination of the physical constants, such as melting point, electrical and magnetic properties.

(g) **Specifications for nickel plating.** At the request of the Federal Specifications Board, the thickness of the nickel coatings on a number of plumbing fixtures was determined. A tentative specification, based upon a minimum average thickness of nickel, has been prepared and is now under consideration.

PLATINUM DEPOSITION

A study of platinum deposition is being made in order to define, if possible, conditions which will yield dense, impervious deposits of platinum which will protect the base metal from the action of corrosive liquids or gases. Preliminary results indicate that most platinum deposits, such as are applied to jewelry, are porous and exert little protective action.

ELECTROLYTIC ALTERATION OF COPPER MAP PLATES

At the request of the U. S. Coast and Geodetic Survey, a method has been developed by which alterations may be made upon engraved copper plates with a considerable saving in time and labor over previously used methods. The operation depends upon a process devised by a member of the Bureau staff, whereby metal can be deposited by means of a stream projected from a nozzle in which an anode is contained. Similarly it is possible to dissolve metal from a given surface by a reverse current. In either case, action occurs only at the point where the projected stream strikes the plate, and not upon the surrounding area over which the liquid flows. In the correction of map plates the copper is first dissolved by this method from the area to be corrected, and may then be redeposited to the desired thickness, or the dissolved area may be brought up to the desired plane by hammering the back of the plate, and copper may then be deposited on the back of the plate if necessary.

*From The Monthly Review, July, 1923.

Silver Recovery

Reclaiming Silver from Movie Waste Develops as an Industry

Written for The Metal Industry by GEORGE F. PAUL

The development of one great industry stimulates other allied industries. This is well exemplified by the motion picture industry, the elaborate setting of which call for the service of everyone from structural steel workers, and tailors to sailors.

One of the unique ramifications is the work of recovering silver from movie laboratory waste. This industry has become so important in and around Los Angeles that the amount of silver recovered every month runs up to the total of about 10,000 ounces.

Certain compounds of silver that are known as haloids give to the motion picture film its remarkable sensitiveness to light. It is necessary to prepare in the dark the emulsion that contains these silver salts. When the film is exposed to light in the camera, those particles of the emulsion that are thus exposed are rendered more easily reducible to metallic silver by the reducing agents composing the developers than are the particles that have not been exposed to light. This being the case, it is apparent that after developing, considerable of the silver compound is left in the film in its original state. In order to make the film transparent, this silver compound must be removed. To accomplish this the photographers make use of a chemical that will dissolve the silver haloid but not affect the reduced silver. Sodium thiosulphite has proved highly efficient for this purpose; furthermore, it is cheap. It is commonly called "hypo." The motion picture industry's side-line business of silver refining has developed because of this dissolved silver salt that accumulates in the hypo bath. The solution finally gets to be so rich in silver, together with other matter from the film coating, that it must be drained off and a new solution supplied. This solution then becomes so-called laboratory waste. The "refineries" have become established in the moving picture districts, take over this solution and subject it to a special treatment in order to recover the silver that it contains.

Naturally there is considerable amount of variation in the silver contained per gallon of water. As a general rule it does not exceed ⅓ of an ounce to the gallon. However, in laboratories where regular analyses of the bath are made, it is allowed, with safety, to run from ½ ounce to one ounce or even more to the gallon. It might be said that the average quantity that is recovered

FIG. 1. ELECTRIC FURNACE FOR SILVER. CHARGE, 500 LBS.

is perhaps between 800 and 850 ounces to the million feet of film. This amounts to about one-half of the silver used in the original coating of the film. This means that when the photographer is shooting scenes having average lights and shadows, the light rays do not affect about one-half of the coating, and thus this

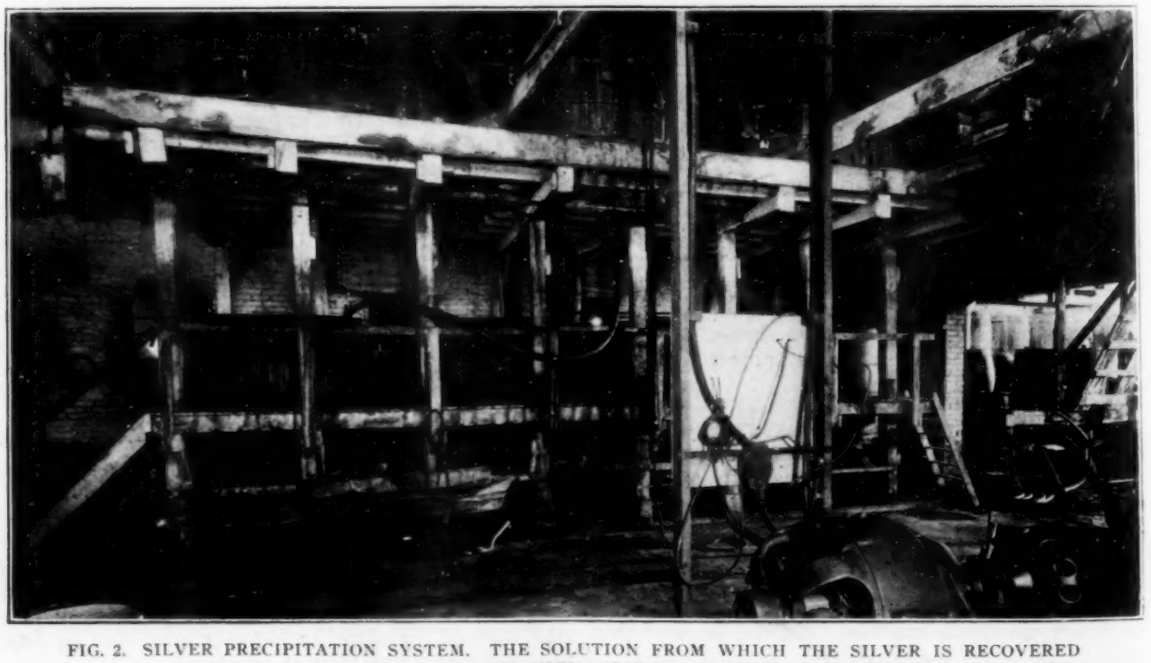

FIG. 2. SILVER PRECIPITATION SYSTEM. THE SOLUTION FROM WHICH THE SILVER IS RECOVERED IS USED AGAIN

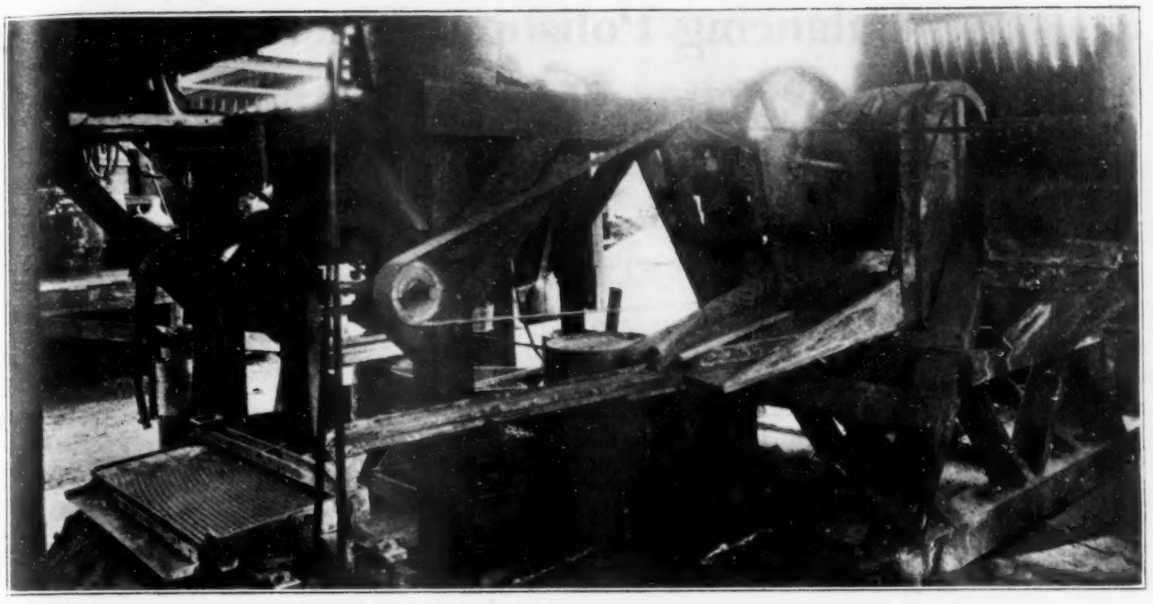

FIG. 3. CONCENTRATOR AND BALL MILL FOR SILVER SLAGS

percentage will be dissolved and removed by the hypo.

There are in the vicinity of Los Angeles some half dozen firms that are engaged largely in this work of salvaging this by-product. Their methods are not uniform. The Chemical Economy Company, one of the representative concerns, uses a catalytic process, which is based on contact action. At their treatment plant, large sheets of iron are immersed or suspended in great storage tanks containing the waste hypo. These metal plates act as if they were powerful magnets. They steadily attract the silver that the waste contains. In the course of about ten days they will have become completely coated with the silver, attracting to themselves practically all the silver in the solution.

After the metal plates are dried, a torch is played over their silver-coated surfaces. This process causes the silver to peel off in scales. These scales are carefully collected and later are melted in a furnace. It is possible to speed up the contact-action treatment through the use of electricity. With its aid the time of extracting the silver can be trimmed down to 48 hours. A furnace heat of about 1,800 degrees Fahrenheit is needed to melt the silver which is poured into ingots averaging 40 pounds each. These are either disposed of at the current price or are sold direct to some United States mint.

Although this work of recovering silver from hypo waste is not new, having been practiced in some form by photographers for years, yet it is only through the development of the motion picture industry to its present tremendous proportions that this side activity has been raised to a place of its own.

Verde Antique Bronze

Q.—I am sending in separate package a sample of bronze molding. Would you be kind enough to let me know how this finish is produced?

A.—The sample you have submitted is termed dark verde antique bronze. The base is what is termed an extrusion metal of the composition of 56% copper, 44% zinc. This metal has the characteristic color of bronze. To produce a similar finish the base metal should be cleansed and then lightly sand-blasted to give the matt effect. Following this operation the articles should be copper plated in a copper cyanide solution for a short time, say 5 to 10 minutes, and then oxidized to a black by the aid of polysulphide or sulphuret of potassium.

Water	1 gallon
Polysulphide or Sulphuret of Potassium	¼ to ½ ounce
Aqua Ammonia	⅛ to ¼ "

Immerse the articles just long enough to obtain a black. Then wash and dry the articles.

In the meantime prepare a Tiffany verde green solution, as follows:

Water	1 gallon
Sulphate of Copper	8 ounces
Sal Ammoniac	8 "
Common Salt	4 "
Chloride of Zinc	1 ounce
Acetic Acid 28%	2 ounces
Glycerine	1 ounce

Prepare the solution in the order given, using hot water for the purpose.

When the solution becomes cool apply to the articles finished as outlined by the aid of a painter's sash brush, ¾ or 1 inch, giving a stippling motion to the brush.

Do not use an excess of the verde mixture. Hang up the parts to dry and the green will form as on the sample submitted.

If one application does not give a sufficient depth of green, then repeat the operation. Do not allow the verde solution to dry on the plain surfaces, as shown in your sample. Remove by cloths moistened with water.

When the articles are finally dry either lacquer by spraying or wax the surface, using a wax paste made up from beeswax and carnauba wax, equal parts, dissolved in turpentine by the aid of heat to the consistency of a shoe polish. Apply very little wax and finally brush down by the use of a soft brush or a goat's hair brush, about 4 inches in diameter. The brush should run at a speed of 400 revolutions per minute for the best results.—C. H. PROCTOR.

Balancing Polishing Wheels

Details of the Treatment of Wheels for Polishing Metals*

By B. H. DIVINE, President, Divine Brothers Company, Utica, N. Y.

The accurate balance of polishing wheels is of great importance. If a wheel is out of balance, the high spot hits the work with a hard blow and produces a scratch which is sometimes difficult to polish out without going too deep, or, if it can be polished out, it requires a lot of extra time and effort to do it.

Many polishing wheels now on the market are fitted with tubes running through them, spaced sufficiently close together and near the edge of the wheel to permit easy balancing, in a way which makes it impossible for the balancing element to fly off the wheel and cause injury as is frequently the case with tacked-on pieces of lead and other devices. Lead wire is inserted in the tubes and upset, and cannot fly out.

Wheel may be slightly out of balance in the coarser processes of flexible grinding or metal reduction without material effect on the work, but in the finer and finishing processes, it is absolutely necessary that a perfect balance be maintained.

SPEED OF WHEELS

Now, in relation to the speed of the polishing wheels, one of the most common questions asked by a polisher is—how fast can I run my polishing wheel? The answer is that the speed of the wheel is limited only by the crushing point of the abrasive and the melting point of the glue, due to the heat generated by the friction of the high speeds, and in either case would leave a large factor of safety in the strain on the wheel itself.

In cutting down processes there have been more speeds of from 3,000 to 4,500 peripheral feet per minute than any other figures obtainable, but, by the perfection of the glue, and the apparatus, as well as the processes for handling it, these speeds have increased to 9,000 and 10,000 feet per minute, and in some cases even more.

Of course, in considering speeds, one necessarily has to take into consideration the character of the metal worked upon. Here again, while standards are badly needed, there are none in existence, but if it were possible for manufacturing concerns to know how to use the glue correctly and to a standard formula, it would be perfectly possible to regulate and set a standard of speeds.

SHAPING THE WHEEL TO THE WORK

A great deal has been done lately along the lines of making wheels exactly shaped to the contour of the piece of work, and this is a point well worth considering in any plant where there is a production of uniform pieces.

This works out in connection with the gauging of small parts. As an illustration, we had this proposition up some years ago with a large concern in England, manufacturing chain drives and who were polishing or grinding the burr from each little sheet metal blank of the chain, one at a time. It never had occurred to them to do anything different, but a process was installed whereby these small punchings could be put into fixtures in quantities and done with a wheel shaped to the work.

On such wheels it is often good practice to build up a paste head of emery ¼ to ½-in. thick which will, of course, last a great deal longer than two or three coats of the emery applied with a brush.

This paste process is used in the silver trade very largely for grinding the burr or flash from forks, etc., the wheel being shaped to take up the entire length of a fork and grind off all the flash from the end of the handle to the end of the tines at one time, leaving each side of the fork a perfect contour and outline.

REMOVING OLD EMERY

As an example of the general crudity existing throughout the polishing industry, it was the custom only a few years ago to remove the old emery from the face of the wheel before putting on a new coat, by either running the wheel on water rollers or using a carborundum brick as a scraper.

In the case of the first practice, you all know what happens to a pair of leather shoes when subjected to moisture and water. Water is destructive to leather under any and all conditions.

In the case of leather covered wood wheel, the water would swell the wheel, even if it did not come in contact with the wood and when the wheel was dried out, it would warp and change shape and be out of true, the leather hardened and the elasticity gone.

On succeeding operations of cleaning, the leather would become thin in the high spots, due to the efforts of the operator to true up his wheels, and sooner or later, it is evident what happens—the wheel becomes useless.

Also, many serious accidents have resulted from the leather loosening and coming off during a polishing operation, and, frequently, injuring an operator badly.

In the case of felt wheels or solid canvas wheels, the effect of moisture was not to change the shape of the wheel, but it was not possible to remove the emery uniformly from the wheel, with the result that high and low spots developed and subsequent headings built up the high spots, the wheel was heavier in those spots, and, therefore, out of balance.

The other process of using the abrasive bricks could hardly be considered an improvement except that it did not soak up the wheel, but no human being could hold a brick in his hand and face off a wheel true.

The advent of the wheel dressing machine, something on the principle of a lathe, with a carborundum or alundum brick, as the cutting tool, was a great step in advance. It permitted a wheel to be kept perfectly true and round, it saved time and assisted in securing perfection in the polishing processes.

Furthermore, it saves the wheel itself for it eliminates the old custom of removing all the emery and glue in order to get down to the face of the wheel and permits only sufficient of the old emery to be removed to make the wheel absolutely round, and, as a consequence, the face of the polishing wheel is never exposed after its first heading up.

It also permits the wheel to be kept in perfect condition for the amount of cushion once established in the original setting of the wheel is not destroyed with each succeeding head. The density is kept uniform and the wheels do not become harder and harder with age, until finally they become useless for the operation for which they were intended.

*From an address before the Meriden, Conn. Branch, American Society of Mechanical Engineers.

THE METAL INDUSTRY

With Which Are Incorporated

THE ALUMINUM WORLD, COPPER and BRASS, THE BRASS FOUNDER and FINISHER, THE ELECTRO-PLATERS' REVIEW

Published Monthly—Member of Audit Bureau of Circulation

Entered February 10, 1903, at New York, N. Y., as second class matter under Act of Congress March 3, 1879

SUBSCRIPTION PRICE, United States and Canada $1.00 Per Year. Other Countries $2.00 Per Year :: SINGLE COPIES, 10 CENTS
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Telephone Number Beekman 0404. Cable Address, Metalustry

Vol. 21 New York, September, 1923 No. 9

Contents

EDITORIAL

WARREN G. HARDING

Without exception the most important event of the past month has been the terribly sudden and untimely death of our President, Warren G. Harding. To supporters and opponents alike comes back the memory that he was a kindly, gentle, warm-hearted personality, with a great talent for friendship. People liked him instinctively because he liked them and because he treated them as he himself would like to have been treated.

His friendly, sympathetic nature rose to its height in his advocacy of the elimination of the 12-hour day, which has resulted in the change throughout practically the whole steel industry from the 12 to the 8-hour shift. His moral support of industry and the strength with which he backed Secretary Hoover and his work to improve business have endeared him to the business public.

It has been truly said that he was a war casualty. The terrific strain of post-war readjustment during a period of extreme depression, the enormous amount of routine work and the heavy responsibilities can be properly blamed for his death. We print on the next page a letter from William Dudley Foulke, president of the National Civil Service Reform League, which cites one method of lessening the President's labors.

Turning for the moment to the new President, Mr. Coolidge, the feeling seems to be general that he will carry on consistently the work which President Harding started. It has been stated with a note of authority that he will give us a business administration. His views in detail on the various problems confronting the country at the present time are not generally known. As Vice-President he made it his rule to say little. However, his record in public office seems to point to a steady course with careful consideration before each act.

STANDARDIZATION

In a letter to the New York Times, dated August 14, 1923, Dr. Charles W. Eliot, President Emeritus of Harvard University, inveighs against "the new blight afflicting education and industries in the United States, particularly the educational part of industries." This blight is standardization. Dr. Eliot feels that standardization, which started in industry to save time, and therefore money, has resulted in the distraction of the interest of the workman in his work. He points out that standardization soon began to affect school and college programs and in that way the liberty of education both as it affected the student and the teacher.

On one point it is impossible to differ with Dr. Eliot. It seems to be fairly generally admitted that work done under stop-watch conditions is not as interesting as the work done by the artisan. Moreover, it must also be admitted that anything however good can be pushed too far. We hold no brief for standardization of college courses or standardized thinking by educators. As industrialists, however, we must state that standardization has its place in the factory and workshop. It must be remembered that standardization was not superimposed from above on industry. It came as a result of a demand from within. Manufacturers were for so many years tormented and driven from pillar to post by useless multiplication of parts, sizes, compositions, styles, etc., that, in sheer desperation, they demanded uniformity. Even a casual reading of the book "Waste in Industry" by the committee appointed by Secretary Hoover will show those who agree with Dr. Eliot, their error, at least so far as industry is concerned.

Standardization does not mean vegetation. It does not mean cessation of new ideas. It prevents no one from improving existing products and methods. It simply eliminates useless duplication. It means clearing away the underbrush. It means removing the many things which have wasted time and energy and prevented us from putting them to better use. Standardization is not a goal in itself. It is a tool. It is possible that many supporters, over-enthusiastic, have pressed the idea into places where it does not belong, but one thing is certain. Standardization has come into industry to stay. It is as indispensable as automatic machinery. It is as important an aid to progress as power.

NEW ENGLAND RAILROADS

Charles F. Brooker, Chairman of the American Brass Company, has stated in a statement to the Hartford Courant on August 12, 1923, that "surrender of New England railroads to the trunk lines would sound the death knell of New England's industrial supremacy." He pointed out that transporting and manufacturing in New England are inextricably interwoven, and that it was therefore unthinkable that New England should give up the control of its railroads. He believes strongly that the New England system should be consolidated and kept in the hands of "New England brains and pluck."

The situation is undoubtedly serious and calls for deep consideration by those who are affected. The industrial life of New England has often been called precarious, due to its location and its transportation difficulties. To put its railroad lines in the hands of those not directly interested in New England's development seems, at the first glance at least, a somewhat dubious procedure for New England. Just how the welfare of the whole country would be affected by the decline of New England as a manufacturing center and the spreading of its plants throughout the country is a question which can be answered only by guesswork. What seems obvious at the present, however, is that with so many depending upon New England industries, and with so much difficulty and distress the immediate result of any dislocation of these industries, every care should be taken to preserve them. If over the next hundred years it is found best for the welfare of America to spread its plants, this can be done carefully and with no discomfort. Moreover, in such a procedure, New England should certainly have a voice. In the meantime, however, Mr. Brooker's declaration should act as a call to New England manufacturers to protect themselves.

PLATINUM PROMOTERS

The Bureau of Mines has published a warning to the public to look very carefully at offers of stock in platinum producing companies in the United States. The Bureau states that this country has produced only a few hundred ounces of platinum per year, but that certain promoters had made very fanciful announcements regarding properties claimed to contain platinum in commercial quantities.

A very interesting method of these promoters is to display a collection of erroneous assays as high as $25,000 to the ton. "In one instance, the assertion was made that a property near Yonkers, N. Y., contained 10,000,000 tons of rock bearing precious metal values ranging from $200 to $600 per ton, totaling a mere bagatelle of from two to four billion dollars. In the case of a Seattle, Wash., concern, the possession of ore containing platinum and gold in astonishing quantities was heralded, while the location of the deposit was kept secret, in order to forestall a mad rush. Numerous samples of alleged platinum-bearing ores from various properties examined by assayers of the Bureau of Mines at Reno, Nev., have failed to disclose the presence of platinum in appreciable quantities. In some instances, definite evidence has been obtained of the 'salting' of samples with platinum wire and foil."

The high price of platinum, due to the cessation of supplies from Russia has caused considerable interest in this matter, and has made the work of these promoters very much easier. For that reason they should be watched with all the more care. The Bureau of Mines states that so far as investigations have shown the possible production in this country is very small. It advises persons who are asked to speculate in a platinum property to let it alone unless the purchaser is prepared to go to the expense of a careful examination by a competent engineer. Serial 2496, by S. C. Lind, C. W. Davis, and M. W. von Bernewitz, giving further details regarding the platinum promotion situation, can be obtained from the Department of the Interior, Bureau of Mines, Washington, D. C.

TIN-COATED SHEET

At a recent conference of the Bureau of Standards with the tin plate manufacturers and canners, a most important difficulty was brought up and threshed out. It seems that the manufacturers of tin plate have been charged by the canners with turning out defectively tinned sheet, which has resulted in spoilage of food packed in tin cans. The difficulty in particular seems to have been the discoloration of food products.

Dr. Burgess, Director of the Bureau of Standards, suggested the formation of a joint committee to carry on research and ascertain the facts, but the representatives of the various tin plate and can manufacturers stated that so much research had already been carried on without either interest or results, that they doubted if anything along the same lines would be of any value. W. D. Collins, formerly of the Bureau of Chemistry, concurred in this opinion and stated that at the present time no one knew the cause of the discoloration of food products in cans, and that so far as the study of the characteristics of steel were concerned, there was no assurance that the problem could be solved. It was also brought out that the amount of tin coating was not a factor in the discoloration. Mr. Collins stated that in cans running in 3 pounds of tin to the base box, discoloration had sometimes been greater than in cans running only 1½ pounds.

The conference finally decided to appoint a committee to lay down standard terms for use in contracts for the purchase of tin plate; also to classify the grades and to adopt standard terms for waster plates.

Relief for the President

[We reprint below a letter sent to the New York Times which states fully and clearly one of our most pressing national needs. It is a strong argument for more business-like methods in government.—Ed.]

To the Editor of the New York Times: A recent editorial in your paper on the ways for assisting the President to secure immunity from the burden of unnecessary work says:

"A public opinion might be created which would frown upon the hordes of office seekers importuning the President."

This would be immensely desirable, but it would take a public opinion almost impossibly strong to prevent a hungry place-hunter from belaboring him with importunities. The easiest way is to put the great mass of offices beyond the jurisdiction of the President by means of civil service requirements. The need of providing for the relief is indeed pressing. William Henry Harrison was killed after only a month in the White House by this cause. The disease was pneumonia, like that of Harding, but it was brought on because he was literally worn out by the crowd of place-hunters that besought him day and night until all power to resist disease was gone. Garfield was actually shot and killed by a disappointed office-seeker, and Harding was so much exhausted by overwork, to which the claims of patronage and the importunities of office-seekers added much, that he was unable to rally, and pneumonia and apoplexy followed.

It is high time to stop this thing, and it could be easily stopped as to all but a few of the very highest places, if the President and members of Congress would enforce to the limit the present civil service law which prescribes competitive examinations and forbids all interference by Congressmen with appointments in the classified service, and if they would extend that service so as to embrace all positions except a few of the highest policy-determining and judicial officers of the Government, such as Cabinet Ministers, a few of the more important Ambassadors and the Judges of the Federal courts. As Theodore Roosevelt well said in his report as Civil Service Commissioner, November 6, 1891:

"The great bulk of the offices of the Government are purely administrative offices. The Post Offices, for instance, should, properly speaking, have nothing whatever to do with politics. The duty of the Postmaster, postal clerk and letter carriers alike is merely to see that the mails are expeditiously and safely delivered. The appointment and retention in office of each one should depend solely upon whether in doing his duties he serves the whole people, without distinction of party, well and faithfully. His position should depend in no way upon his party predilections, for his capacity to perform his duties has not the slightest reference to his opinions on the tariff, the currency or any other of the great questions upon which parties divide. There are properly very few of the many offices in the gift of the Government which are really political in character, after we pass below the highest, such as the members of the Cabinet and the ministers to foreign countries. The duties of the bulk of Government officials have, or should have, no reference whatever to politics, and they should be divorced entirely from politics. No question before the American people today is so important as this question of working a thorough and radical reform of the civil service by separating it entirely from partisan politics, for no other reform so vitally affects that most important of all questions, the securing of a pure, an honest and an upright Government."

The Civil Service Commission has the power to choose a great part of all subordinate officers. They ought to have that power extended so as to relieve the President still more. An application will soon be made to President Coolidge by the Civil Service Reform League to take some effective steps to bring about the relief from office-peddling which the President so greatly needs. This is the time to press the issue home.

WILLIAM DUDLEY FOULKE,
President National Civil Service Reform League.
New York, Aug. 20, 1923.

CORRESPONDENCE and DISCUSSION

Although we cordially invite criticisms and expressions of opinion in these columns, THE METAL INDUSTRY assumes no responsibility for statements made therein

THE SHOP SUGGESTION BOX

To the Editor of THE METAL INDUSTRY:

Having read over the article "The Shop Suggestion Box" by Wm. H. Parry in the August issue, pages 322-3, I note the point of view he takes on the subject, that the net results are so disappointing. I am strongly of the opinion that no one point of view, however broad, can be entirely comprehensive. The high percentage of men that the writer quotes (ninety-nine per cent of factory employees) who never allow their thoughts to dwell on any serious subject, and unless a person's mind is not trained in straight and clear thinking, their suggestions are seldom of value. I may inform Mr. Parry that my experience is that much depends upon the mentality of the men themselves, of the foremen, and of those responsible to the management.

In one firm with which I have been intimately acquainted, suggestions are expressly solicited. Those giving suggestions offer their ideas quite openly, giving their names and departments. Approved suggestions are accepted and paid for in cash, and in addition their names are specially bulletined and mentioned in the company's quarterly periodical together with the nature of the suggestion and the amount of the award. A feature of this is that when an idea is turned down a reasoned statement is supplied. If an idea as distinct from its immediate application promises well due credit is given for it.

In brief, the management welcomes suggestions and takes pains to let the fact be known. There is thus a healthy rivalry between the departments, the heads of departments and foremen enter into the spirit and play the game fairly. Where such conditions prevail, it is the opposite of Mr. Parry's article.

Where, however, the management is keen for improvement and the foreman proves the stumbling block two main alternatives offer. There is the sealed suggestion box system which cannot be expected to work very successfully where there is a big inertia drag to overcome; or, the management can make it known quite plainly that the foremen have been told that suggestions are invited from the operatives in their respective departments and that it is up to them to encourage their men, and that progress shown will be adjudged a department success. When the individual foreman once realizes that his co-operation and support can help his men to make good, not only will the team work improve, but he will know something of the scoutmaster's pride in the success of his troop.

There is the case, however, where the foreman is not only apathetic, but perhaps entirely in opposition. In such a state of affairs unless the whole thing is allowed to fizzle out the closed suggestion box seems to be the most practicable thing. Once men's imaginations are fired, things begin to happen and they think it is time to wake up. I have seen it work.

P. W. BLAIR.

Westmount, P. Q., Canada, August 18, 1923.

SAMPLES FOR NICKEL PLATING

To the Editor of THE METAL INDUSTRY:

I am desirous of obtaining the following classes of goods to continue with my work on the plating of zinc, die castings and zinc plated steel. I hope you will find it possible to publish this in an early issue, as I am finishing my work on this phase of nickel deposition and possibly some of your readers can send me some of the items. I need 2 or 3 dozen pieces of die castings polished and buffed for plating; some sheet zinc metal novelties; some pieces of sheet zinc about 1 ft. square; several dozen steel articles zinc plated.

I desire these items, as you readily understand, to further test out various results I have obtained, that will be published in the "Survey of Nickel Solutions," which you now have under publication.

JOSEPH HAAS, JR.

Muncie, Indiana, August 6, 1923.

ESTAFADO FINISH

To the Editor of THE METAL INDUSTRY:

Our clients, the Edward N. Riddle Company, Toledo, Ohio, have called to our attention an article appearing in your magazine for July, page 277, regarding "Estafado Finish."

We desire to inform you that "Estafado" is a coined name which has become the trade-mark duly registered by our clients in the U. S. Patent Office under date of Jan. 25, 1921, registration No. 139,194, for goods bearing the Estafado Finish as applied to electric lighting fixtures and lamps, shades, globes, balls and reflectors adapted for use in electric lighting and is an infringement of this trade-mark.

We feel sure that as a matter of protection to your readers who might be misled in reading the article referred to you will be glad to publish this information in your next issue, sending the Riddle Company a marked copy thereof.

Thanking you in advance for the courtesy of this seemingly necessary correction, we remain,

Yours very truly,

DODSON AND ROE, Attorneys at Law.

New York, August 14, 1923.

Technical Publications

ALLOYS FOR COAL MINES

BY R. J. ANDERSON AND G. M. ENOS

Bulletin 5, on Coal Mining Investigations, issued by the Carnegie Institute of Technology, Pittsburgh, Pa., covers the results of microstructural examination of more than 50 metals and alloys which had undergone corrosion from immersion in acid mine water. The work was performed at the Pittsburgh experiment station of the Bureau of Mines, Department of the Interior, in co-operation with the Carnegie Institute of Technology and an advisory board of coal mine operators and engineers.

The corroded test specimens of metals and alloys examined had been immersed for periods of some months in acid mine waters for the purpose of determining the corrodibility of various materials in such waters. It was found that in brasses, the grain size seems to have little, if any, effect upon the rate or nature of the corrosion. There was selective corrosion in some of the bronzes and brasses. Aluminum and aluminum alloys pit so badly that selective corrosion cannot be identified as such.

Some alloys which, after corrosion and subsequent cleaning, appear to be free from adhering coating or precipitate, have a very hard and probably quite impervious coating acting as a protection; this is particularly true of the bronzes.

Corrosion attack does not, in general, follow grain boundaries, but proceeds through the less resistant material if two or more phases be present.

Study has not yet been made of very thin coatings or films, nor has study of the thicker coatings—protective and otherwise—been completed. Some data have been accumulated, and further research on the film problem is in progress. Laboratory experiments are contemplated to determine the nature and extent of films that are of ultra-microscopic thickness, but which may be protective.

X-RAY EXAMINATION

BY A. ST. JOHN*

Until recently the X-ray examination has been possible only on objects of small and approximately uniform thickness. Dr. St.

John, however, has developed a method for examining irregular metals in such a way as to show defects in their structure. It is stated that the method is simple, rapid and inexpensive and can be used on a commercial scale. Small quantities can be detected and a large variety of objects examined. It is possible to correlate mechanical tests with the internal structure disclosed by the radiograph. Any object that can be penetrated sufficiently by X-rays can now be radiographed successfully.

*From paper to be presented at the Canadian meeting of the A. I. M. E. in Montreal, August 30. Dr. St. John is in the Research Laboratories of the Union Carbide & Carbon Company, Long Island City, N. Y.

CURRENT DISTRIBUTION AND THROWING POWER IN ELECTRODEPOSITION*

By H. E. Haring and W. Blum

"Throwing power" in electrodeposition may be defined as the deviation of the actual metal distribution from the primary current distribution. It is shown mathematically and experimentally to be dependent upon (a) the rate of change of cathode potential with current density, (b) the resistivity of the solution, and (c) the cathode efficiency at different current densities. A simple apparatus for the measurement of throwing power has been developed, and applied to the study of copper sulfate and cyanide solutions.

COBALT—ITS PRODUCTION AND USES

By C. W. Drury

In the preparation of the following paper dealing with the production and uses of the metal cobalt, an attempt has been made to review only the essential points. An extensive study of the occurrences, metallurgy, uses and alloys of the metal cobalt was published recently, and the reader is referred to that report for any detailed information.

CHROMIZING

By F. C. Kelley*

It is the purpose of this paper to give a brief summary of the work which has been done to date upon the diffusion of metals in the solid state, and to describe in detail the process of chromizing and its effects upon the physical and chemical properties of iron. The practical application of this problem is also considered.

*From a paper presented at the Forty-third General Meeting of the American Electrochemical Society in New York, May 3-5, 1923.

New Books

Engineering Inspection, by Allcut and King. Published by D. Van Nostrand Company. Size 6½ x 10, 187 pages. Price, payable in advance, $5.00. For sale by The Metal Industry.

This work presents to the reader in a compact and convenient form, a description of the various principles involved in the inspection of a manufacturing job from raw material to to the finished article. It includes the testing and inspection of raw materials, of partly finished materials and of finished materials by gauging and measuring. It covers machine shop inspection and inspection of the fitting and erecting shop.

A chapter is devoted to what is called final tests, such as running or proof tests, consumption and performance tests. Physical testing of metals is, of course, an important item. The author admits the obvious impossibility of going into full detail in every case which might come up, but as he states, it is not necessary to do so. Representative examples are shown of general engineering practice which illustrates the different principles of inspection and measurement in common use. The book specializes on mechanical engineering operations, a number of which will be found significant to those engaged in the manufacture and handling of metals.

Journal of the Institute of Metals. Volume XXIX. Published by British Institute of Metals, 36 Victoria Street, London, S. W. 1, England.

This is the semi-annual volume of proceedings issued by this Institute. It includes the papers read at the meeting in March, 1923, and in addition abstracts of papers relating to metals throughout the technical press and other literature. Most of the papers read at this meeting were abstracted in The Metal Industry for April, 1923. This volume, however, includes the discussions which followed the reading of papers.

Causes and Prevention of Corrosion, by Alan A. Pollitt. Published by Ernest Benn, Ltd. Size 7¼ x 10, 240 pages, 46 illustrations.

The book is divided into three parts. The first explains why and how metal corrodes and the theories advanced to account for this phenomenon. The second part deals with the practical causes of corrosion, both within and without the metal itself. Part 3 deals with the prevention of corrosion both by treatment of the metal itself and by control of the conditions which the metal has to face in actual use. Protective coatings, metallic and chemical, are discussed, and also paints. Considering the importance of the problem and the amount of work that has been done on it, published volumes are surprisingly few. This book will be found of real value and will take an important place in the field in which there is room for many others.

Trade Association Activities. Prepared by L. E. Warford and Richard A. May under the direction of Julius Klein, Director of the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C. Size 6 x 9, 368 pages. Price 50c.

This publication is issued by the Department of Commerce, as one of the Elimination of Waste Series, which can be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C. It is the first attempt on the part of the Department of Commerce to describe the constructive activities of trade associations as such, and is a tremendous step forward in guiding both trade associations and individual businesses in their conduct.

The book includes a complete description of trade association activities, statistics of associations, legal aspects of these statistics, legislative activities, simplification and standardization, cost accounting, credit and collection activities, trade disputes and ethics, employee relations, insurance relations, transportation, commercial and industrial research.

Several chapters are also devoted to the activities of the government through its various departments and bureaus in helping trade and industry both through associations and directly. The book is indispensable to every business owner or member of a trade association.

Metals and Metallic Compounds, by Ulick R. Evans. Published by Longmans, Green & Company, in 4 volumes. Size 6 x 9. Volume 3, 270 pages; volume 4, 350 pages. Price, payable in advance, volume 3, $4.75; volume, 4, $6.00. For sale by The Metal Industry.

The first two volumes of this series were reviewed in The Metal Industry for August, 1923. As stated there, this is a comprehensive work embracing the entire subject of all the metals and their compounds. Volume 3 covers the transition elements, among which are included iron, cobalt, nickel, ruthenium, rhodium, palladium, osmium, iridium and platinum. In conformance with the rest of the series, these elements are taken up from their terrestrial occurrence, their metallurgy and laboratory technology, their uses and practical working including recovery, alloying, etc.

Volume 4 embraces the metals of the B groups, which include copper, silver, gold, zinc, cadmium, mercury, indium, thallium, germanium, tin, lead, arsenic, antimony and bismuth. At the end of each volume is an author index and a subject index. A list of journals referred to is also included.

GOVERNMENT PUBLICATIONS

Antimony in 1922, by F. C. Schrader, U. S. Geological Survey, Washington, D. C.

Bauxite and Aluminum in 1922, by James M. Hill, U. S. Geological Survey, Washington, D. C.

Fluorspar and Cryolite in 1922, by Hubert W. Davis, U. S. Geological Survey, Washington, D. C.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ALUMINUM IN YELLOW BRASS

Q.—How much aluminum is recommended to use as a flux for yellow brass castings? Is aluminum a detriment to the quality of yellow brass castings? Has aluminum a tendency to make them spongy, or full of blowholes? Can a thinner section of castings be cast with aluminum as an alloy than without? Does aluminum reduce the tensile strength? Does aluminum in yellow brass castings help to increase production by easier machining and polishing? Has aluminum in yellow brass castings any detrimental effect on the nickel-plating process?

Castings referred to include the different lines of plumbing goods, like bibb bodies, basin cock bodies and bath cock bodies.

A—1—Amount of aluminum recommended for use as a flux for yellow brass is ¼ of 1%.

2—Aluminum is not detrimental to the quality of yellow brass castings when castings are not used for pressure work.

3—Aluminum has a tendency to make the yellow brass spongy, or full of blow holes when the yellow brass contains over 1% lead.

4—A thinner section can be cast with aluminum as an alloy than without.

5—Aluminum has a tendency to increase the tensile strength of yellow brass.

6—Aluminum makes the yellow brass more difficult to nickel plate, but it can be plated.

7—Aluminum added to yellow brass for plumbing goods is very detrimental as it causes the castings to leak when subjected to pressure.

No flux that we know of has ever been found to overcome this difficulty. If you use yellow brass containing aluminum you may expect a large number of rejections, due to leaks.—W. J. R. Problem 3,234.

CASTING BRONZE TABLETS

Q.—In casting bronze tablets with portraits in bas-relief, our moulders have some trouble in getting smooth the parts of the portrait which are not to be chased. Will you please let us know what percentage of French sand has to be used in connection with Albany sand and how is a double facing prepared? Or do you think a larger percentage of tin in the castings would get the desired result? It may be that our moulders get the metal too hot, being afraid it will not run, and this results in the burning of the facing, which brings out rough spots in the castings.

A.—The best practice is half French sand and half Windsor lock sand; no facing is required. On bronze work a very good mixture is as follows:

Copper	88
Tin	7
Zinc	4
Lead	1

This metal will run well, and if new metal is used will make a very sharp, smooth casting. You, of course, understand for this class of work the molds must be dried.—W. J. R. Problem 3,235.

DENTAL DIE PLATE

Q.—For about 25 years I worked in a chandelier foundry, where we skin dried all our molds and turned out castings from first class highly chased patterns. I was using thin Philadelphia facing sand, also French sand for false cores. I am now in the dental field, and am very much interested in plaster molds, Cire Perdue process, where we cannot have regular patterns.

But I have to make dental die plates in the near future, the plate to be used to swage the cusps of crowns and gold bridges used in the mouth. This metal in the die plate must be very hard and cast smooth or clean and sharp. As I have been out of foundry practice some fifteen years, think I am out of date. Would you advise as to skin drying my molds? Would you use Philadelphia facing sand or Windsor lock, and what alloy would you advise?

A.—For this class of work we would suggest that the mold be skin dried. In regards to the sand used, we should recommend one-half Windsor lock sand and the remainder old molding sand with a little molasses water. Dry mold with a blow torch.

The alloy we would suggest consists of 88% copper, 2% iron and 10% aluminum. Place the iron in the bottom of the crucible, in the shape of tin plate, with charcoal. Add the copper, and when the copper is melted add the aluminum. Stir well and pour into ingots. Re-melt for casting. Use a long runner to the gate and if the mold is properly made you should get a very desirable casting. —W. J. R. Problem 3,236.

DIE CASTING METAL

Q.—For several months we have been worrying along with a die casting that is very puzzling. Our customer specified a mixture of 92% zinc, 3% copper, 5% aluminum, with ¼ of 1% each, allowance for lead and iron, no other impurities. They require that these castings bend considerably before breaking.

In order to accomplish this result, we accordingly alloyed the three parts in virgin metals. We are sure that in every case our temperature, etc., was correct. The resulting castings were brittle. We then tried 92% zinc, 3% manganese copper (30% manganese, 70% copper) and 5% aluminum. The castings obtained from this mixture had fairly good bending qualities—about 50% of same making a good bend, and the remaining 50% being brittle.

We thereupon tried another mixture—92% zinc, 3% copper and 5% silicon aluminum. These castings were brittle.

Our last attempt was 92% zinc, 3% manganese copper (30% manganese, 70% copper) and 5% manganese aluminum. These castings were also brittle.

A.—In order to get the best bending quality of such a mixture the first thing necessary is to get the best grade of zinc. We would suggest Horse Head zinc be used. Make a hardener of 62½% aluminum and 37½% copper. Melt the copper under charcoal so the copper is just melted and then add about 4 lbs. of aluminum, stir well and then add 1 lb. of 30% manganese copper (use pure manganese, not ferro), stir well and then add the balance of your aluminum. Pour in ingots and use as follows: melt 92 lbs. of Horse Head zinc and add 8 lbs. of the hardener. Make your cast at as low a temperature as possible. A great deal of the quality you desire depends upon the temperature, so make it as low as possible.—W. J. R. Problem 3,237.

HARDWARE GREEN FINISH

Q.—We have some brass trimmings for some antique furniture to match up in color as well as design. This work is a little out of our line, and we have made the trimmings as an accommodation. Will you kindly tell us how to color them? The trimmings are made out of commercial high brass and the color required is a golden color of greenish cast.

A.—It is somewhat difficult to give instructions for finishes without an examination of a sample. Your term, "a golden color of a greenish cast," would indicate that the finish you desire to match is similar to a "hardware green finish."

The high brass castings should be finished to a fine emery finish, cleansed thoroughly and immersed in the following solution for a moment or two until the brass is covered with a greenish color.

Water	1 gallon 180 deg. Fahr.
Hyposulphite of soda	8 ounces
Nitrate of iron	2 "

As soon as the green tone is noted remove the castings and wash in cold water. Then remove the green tone from the high lights with a tampico brush or wheel and use a little pumice stone and water as the abrasive.

After brushing, wash the articles again and immerse the articles in the dip for a second only. The high lights from which the green was removed will take on a golden tone. Remove quickly to the cold wash water. Then dry out and lacquer with any ordinary brass lacquer.

A gold lacquer may be used to lacquer the articles. In such an event it will not be necessary to use the green dip to obtain the gold color.—C. H. P. Problem 3,238.

RECOVERING GOLD FILINGS

Q.—I am in the manufacturing jewelry business and one of your subscribers. We used to send out our scraps and filings to be refined, but some time ago tried to do it ourselves. We dissolved the filings in aqua regia (one-third nitric, two-thirds muriatic) and threw the gold with iron sulphate and melted the precipitate. The first time it worked fine, but on two later occasions the resulting fine gold was brittle and split up on being rolled out.

Can you advise us how to prevent this?

A.—It seems strange that in refining your own gold scraps and filings the first attempt proved successful, the second and third resulted in the fine gold being brittle and split on being rolled into sheet. Yet in both instances the scraps and filings were dissolved in aqua regia and the gold precipitated with iron sulphate.

The question arises where did the difference come in? Some metal impurity must have come down with the gold in melting in the second and third melting, or the results would be identical with those in the first melting. It is customary to melt the gold in the finest crucible obtainable, and at the time of melting to mix the gold with a small amount of bisulphate of potash and borax as a flux.

Stone molds are best for preparing the ingot. Then no metal impurities can contaminate the gold in the form of oxides, such as could occur when an iron mold is used. Oxide of iron could cause brittleness.—C. H. P. Problem 3,239.

NICKEL-PLATED KITCHEN UTENSILS

Q.—We are manufacturing a high grade line of aluminum kitchen utensils and would like your advice on the question of using nickel-plated steel trimmings, such as ears and bails for the kettles and handles for sauce pans. It has been the custom to use tinned steel ears, but we do not seem to get the quality we desire with the tinned product. We know that nickel-plated trimmings will cost two or three times as much as the tinned, but this will not be objectionable. We hesitate in adopting the nickel-plated trimmings because we do not know how nickel-plated steel will stand up under the requirements of the kitchen. Will the acids or ingredients of apples, tomatoes, potatoes, etc., tarnish this nickel-plating during cooking? Will the exposure of the utensils to heat in the oven, or the subsequent cleaning cause the plating to peel off or discolor? Would the nickel-plated trimmings answer the purpose as well or better than tinned steel trimmings?

A.—We do not favor nickel-plated steel trimmings for aluminum kitchen utensils. The juices of many fruits and vegetables have a discoloring action upon nickel. In our opinion electro-tin deposits would be ideal for the purpose. The color of electro-deposited-tin resembles aluminum, although somewhat whiter in tone. Steel parts when clean and bright as a result of mechanical tumbling operations can be readily plated in electro-tin-plating solution prepared as follows:

Water	1 gallon
Sodium stannate	14 ounces
Sodium hydroxide	3 "
Potassium cyanide	1 "

Temperature of solution 160 to 180 deg. Fahr. Voltage 1 to 2. Amperage per square foot of surface 8. Pure cast tin should be used as the anodes.—C. H. P. Problem 3,240.

OXIDIZING BRONZE STAMPINGS

Q.—Will you kindly inform us how to black oxidize bronze stampings. We know of different methods on any kind of metal such as yellow brass, cast iron, etc., but the same method does not work properly in bronze metal. That is, this method takes the oxide all right, but this process is too slow. What we want is a dipping solution into which about 100 of an article can be dipped and oxidized black or bluish black in one immersion.

A.—We are of the opinion that a solution prepared from lead acetate and sodium hyposulphite will give the best results in oxidizing bronze stampings.

The usual oxidizing solutions for brass and copper do not give good results upon bronze. Try the following formula. Heat in an iron kettle to 200-212 degrees Fahr., and immerse the article until dark enough for your purpose.

Water	1 gallon
Sodium hyposulphite	8 to 12 ounces
Lead acetate	4 to 6 ounces
Acetate acid	⅛ ounces

This type of solution is used by the lock firms in Reading for antique finishes.—C. H. P. Problem 3,241.

RED ON SILVER

Q.—We wish to do some coloring similar to the sample sent herewith and would like to know what is used and how same is applied.

A.—We should infer that the scarlet color on the silver-plated thimble submitted to us as a sample is a lacquer enamel color.

Good lacquer manufacturers can furnish such an enamel. Submit your sample to them. They will be pleased to furnish you samples for trial purposes, and submit data covering their application. The color is no doubt applied with pencil brushes and the letters wiped out with the enamel solvent.—C. H. P. Problem 3,242.

PORTABLE ELECTRIC LAMPS

Q.—We would ask you kindly to advise us as to the kind of metal used in portable electric lamps, what the mixture is composed of and where we would be able to procure it.

A.—Antimonial lead is used almost universally in the production of castings for electric portable lamps and other similar fixtures. It is a by-product resulting from smelting lead-silver ores and consists of lead, 86-88 and antimony, 12-14.—C. H. P. Problem 3,243.

SILVER FINISHES

Q.—How can we obtain what are known as platinum, butler and French gray silver finishes? Must the articles be high bright color before applying either of these finishes?

A.—Platinum, butler and French gray finishes are all about the same. To avoid scratches in the final finish it is advisable to finish the articles to a good high color, although if care is used the regular cut-down should answer the purpose.

The semi-lustre of thees finishes is finally produced with horse or goat's hair brushes. The polishing medium is white wax or a mixture of wax and tallow.—C. H. P. Problem 3,244.

METAL FOR HANDLING PHOSPHATES

Q.—We are mixing a superphosphate and are having lots of trouble with the pumps that we are using to pump the hot acid from one tank to the filter. The composition that we are using for the pumps is:

93% lead, 7% antimony.

73% copper, 25% zinc, 2% tin.

89% copper, 11% aluminum.

We have to renew the pumps about every week. Kindly advise at once what recommendation you have to offer to overcome these difficulties.

A.—The most important part to take care of in overcoming your trouble is to get a casting free from oxide or dross; in other words, get the casting solid and sound. If not, the acid attacks the weak part of the casting and eats it out.

The composition we would suggest is 90% copper and 10% aluminum. Melt the copper under the charcoal, and when melted, add the aluminum, stir well and pour in the ingots and remelt remelt for casting.

Your casting must be clean and free from shrink or any other imperfects. This alloy is used in most of the mills now for carriers for pickling vats, and is said to give excellent results.—W. J. R. Problem 3,245.

PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

1,457,149. May 29, 1923. **Preparing Aluminum or Its Alloys for Electroplating.** Harry Douglas Cunningham, Brighton, England.

The process of electroplating articles of aluminum and its alloys, comprising an initial cleaning of the article, then treating the article with a mixture of an abradant and a solution of copper sulphate so as to remove oxide and simultaneously impart a coating of copper to the article, and finally electroplating the article.

1,457,288. May 29, 1923. **Bronze Alloy and Process for Its Production.** Peter Ostendorf, Berndorf, Austria. An improved bronze alloy consisting of not less than 87 parts by weight of copper, 4½ to 10 parts by weight of tin, 1 to 5 parts by weight of nickel and 1 to 5 parts by weight of zinc.

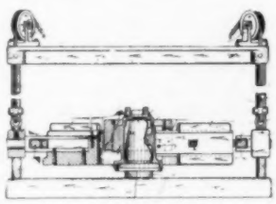
1,457,289. May 29, 1923. **Copper and Zinc Alloy.** Peter Ostendorf, Berndorf, Austria.

An improved alloy consisting of 40 to 55 parts by weight of copper, 3 to 15 parts by weight of nickel, 1 to 3 parts by weight of manganese, 1 to 2 parts by weight of iron, ½ to 3 parts by weight of aluminum and 25 to 40 parts by weight of zinc.

1,457,375. June 5, 1923. **Mold Mixture.** Victor Lougheed, San Francisco, Calif., assignor to Enterprise Foundry Company, San Francisco, Calif.

A porous mold for casting metal, said mold being composed mainly of a refractory porous substance and containing calcium sulphate limited in quantity to that sufficient for binding together the said substance without destroying its porosity, and a basic substance capable of combining with the trioxide element of the binder and limited in quantity to that sufficient to render said element non-reactive with respect to the metal to be cast.

1,457,439. June 5, 1923. **Core-Making Machine.** Oskar Kylin, Elkhart, Ind., assignor to Foster Machine Company, Elkhart, Ind.



In a core machine, the combination of a plurality of core forming segments having tapered outer surfaces, an internally tapered annular member adapted to clampingly engage said tapered surfaces of said segments, radially movable segment-actuating members pivotally attached to the outer sides of said segments, relatively stationary guides forming supports for said movable members, and means for actuating said moveable members.

1,457,857. June 5, 1923. **Metal Polish.** William Albert Ruddell, Asbury Park, N. J.

A polishing composition comprising a mixture of silver-potassium cyanide, potassium cyanide, potassium nitrate, borax, whiting, water and alcohol.

1,458,222. June 12, 1923. **Method of Gating Castings.** James F. Dieter, Highland Park, N. J., assignor to International Motor Company, New York.

The herein described method of casting comprising forming a riser in communication with the runner, and between the pouring basin and the mold proper, whereby the riser fills with the last poured metal, which metal feeds into, and exerts pressure on, the metal in the mold during the cooling thereof.

1,458,283. June 12, 1923. **Furnace for Melting Metals.** George D. Faulds, Philadelphia, Pa.

A melting furnace having a combustion chamber and comprising a relatively deep fusion hearth, a high front bridge wall between the hearth and combustion chamber, a curved top wall to direct the hot gases over the bridge wall and then downward upon the hearth and a sloping outlet passage to conduct the gases away from the hearth in a continuing downward direction, said top wall having a filling opening located above the hearth and toward the rear side, whereby the material fed through said opening may pile upon the hearth to partially constrict said passage and also to present a broad side exposed to direct contact with the gases coming from the combustion chamber to hasten fusion.

1,458,290. June 12, 1923. **Method of Preparing Metallic Alloys and of Refining Metals and Alloys.** Horace Campbell Hall, Derby, England, assignor to Rolls-Royce Limited, Derby, England, a British Company.

A method of preparing metal alloys and of refining metals and alloys consisting in introducing into a main molten constituent an additive metal or metals in a granulated and oil coated condition.

1,458,570. June 12, 1923. **Lead Molding Used in Galvanoplasty.** Edouard Boudreaux, Paris, France.

In an improved process for molding galvanoplastic plate consisting in applying a reticulated sheet to the lead sheet which takes the impression of the type and finally applying a sufficient amount of pressure for molding to temporarily render the sheets integral.

1,458,604. June 12, 1923. **Method for Making Zinc Tubing.** William L. Woodward, Lakewood, Ohio.

The herein described method of making seamless zinc tubes which consists in shaping a strip of zinc into tubular form, welding the joint thereof and subsequently restoring the molecular homogeneity of the tube as a whole.

1,458,605. June 12, 1923. **Method of Making Seamless Tubes Rich in Zinc.** William L. Woodward, Lakewood, Ohio.

The herein described method of making seamless tubes of material rich in zinc which consists in first producing a crystalline tubular body of a material rich in zinc and then mechanically treating said tubular body to break up the crystalline structure thereof and render said tubular body ductile and malleable.

1,459,171. June 19, 1923. **Apparatus for Removing Abrasive Disks from Grinding Wheels.** Frederick A. Willard and Mathew D. Willard, Jackson, Mich.

In a structure of the class described, the combination of a supporting base, an inverted frusto conical grinding disk holder adapted to receive and support grinding disks of varying sizes mounted on said base, a steam generating pan secured to the lower edge of said disk holder to deliver thereto, and a heating burner mounted on said base below said pan.

1,459,910. June 26, 1923. **Method of Removing Rust from Metal Articles.** Julian S. Gravely, Wytheville, Va., assignor to Winchester Repeating Arms Company, New Haven, Conn.

A method of removing rust from metal articles consisting in subjecting them to the action of a substantially neutral solution of the ammonium salt of an organic acid, and then, after a due interval of time, washing off the resulting slime produced by the reaction of the ammonium salt solution upon the rusted surface of the article.

1,460,085. June 26, 1923. **Apparatus for Shaking Out Castings.** Harry C. Watson, Canton, Ohio.

Apparatus for shaking out castings, comprising a table having a series of spaced fixed bars, and a series of alternating vertically movable bars, together with actuating connections for the movable bars, said connections being operative to produce a positive raising of the movable bars and then inoperative to permit a substantially true gravity drop thereof independently of further movement of said connections, substantially as described.

1,460,137. June 26, 1923. **Method of Plating Metals.** Hubert A. Myers, Toledo, Ohio.

The method of metal plating an object, which consists in electrically melting and welding particles of the metal to the surface of the object, and smoothing, by rubbing the surface as the metal is deposited.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

One Piece Lining for Brass Melting Furnace

The method of lining oil-fired brass melting furnaces as used by the Canadian Bronze, Ltd., of Canada, in their plant located at Montreal, will be of interest to brass foundrymen in general.

Instead of using special shapes which require very accurate fitting, they make a one-piece lining, using crushed, old fire brick bonded with Hytempite.

This type of lining is giving them three to four times the life of the linings formerly used, and, in addition to that, they have reduced the melting time from an hour and a half to forty minutes, due to the fact that the former linings, which were made of tile, were high in conductivity. Moreover, the hot metal frequently found its way into the joints and back of the linings, with the result that considerable metal was left in the furnace after each day's run.

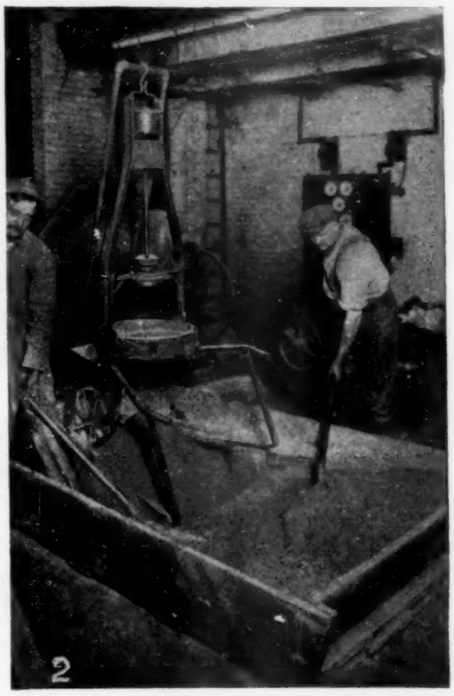


FIG. 1. HYTEMPITE AND CRUSHED FIRE SAND AT MOLDING SAND CONSISTENCY

The use of a one-piece lining of crushed old fire brick bonded with Hytempite has, it is claimed, doubled the capacity of the furnace; yet, the only change which has been made is in the lining itself. The adjoining series of photographs show the method of preparation and application of the one-piece lining.

First, water is added to Hytempite, which has been placed in the mortar box to be diluted to the thickness of a pancake batter. The method of mixing the lining is as follows:

Old furnace linings—bats, etc., which frequently find their way to the scrap heap, are crushed to pass ¼-inch mesh. This material, including the fines, is then added to the Hytempite batter and thoroughly mixed, using a garden hoe and shovel. Enough crushed brick is added to make a mixture of the consistency of molding sand. This mixture should be dry enough so that it is possible to pass it through a riddle, (R) as shown in Figure 1.

FIG. 2. TAMPING LINING UNDER FORM

A wood form (F) is made, the outline of which will conform to the inside surface of the lining.

The mixed material is then tamped in along the bottom of the furnace shell to a sufficient depth to allow the form, when put in place, to rest upon it (Figure 2).

The form is then put in place (Figure 3) and the lining material filled in between form and shell and rammed in snugly using alternately the ball and peen end of the rammer.

In Figure 4, the form has been removed and a straw fire started so as to dry the lining before applying a wash coat of Hytempite batter.

The wash coat is then applied using a stiff brush.

Before closing the sides, as shown in Figure 5, a wash coat of Hytempite batter is applied all over the upper surface of both sides of the lining so that when the shell is closed, the two halves will be sealed and the lining then becomes one piece, without joints at any point.

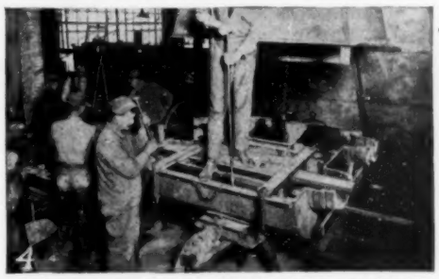


FIG. 3. BOTTOM TAMPED AND FORM IN PLACE

After the shell has been bolted, the furnace can be put in operation at once, without injury to the lining. The furnace was lined under the supervision of a service engineer of the Quigley Furnace Specialties Company, Inc., 26 Cortlandt street, New York, manufacturers of Hytempite.

FIG. 4. SIDE WALLS PACKED, FORMS REMOVED AND STRAW FIRE FOR DRYING

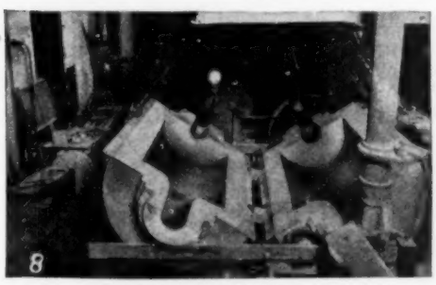


FIG. 5. SHELL BEING CLOSED AND READY TO OPERATE

IMPACT TESTING MACHINE

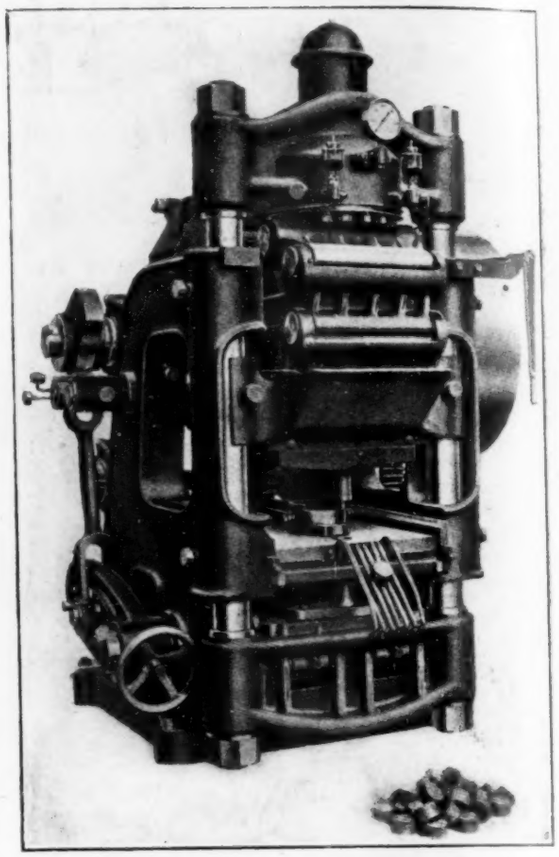
The Izod impact testing machine is sold by E. H. Buttman Company, Cleveland, O. This machine tests the strength of metals against shock. A heavy pendulum, several feet long, is mounted on ball bearings between two frames. At its lower end is a hardened tool-steel bar to break the specimen, which has been placed in a vise. The pendulum is raised and allowed to strike the test piece, which is broken. The pendulum continues on its swing, but a greatly decreased distance, due to the absorption of energy by the test piece. The foot-pounds required to break the piece are read on a dial.

NEW BRIQUETTING PROCESS

This process of briquetting and recovering turnings is not new. It is well known in Europe, and is patented under the name of "De Gama Process for the Recuperation of Turnings, Ores and Metal Residues, Cold, Dry and Without Binding Material." It has been used in France for many years, and was especially developed during the war, as a consequence of war necessities. It was employed in the copper industry at the beginning of the war, when the fuses of practically all French shells were made of copper, and the rotating bands were not yet made out of the alloys which were employed in their construction after 1916.

It is stated that this process of briquetting is based upon new principles. The agglomeration is not obtained by the use of any binding material, because laboratory tests show that this binding material does not resist more than 2,000° F. in the furnace, and many metals require a much higher temperature before coming to the melting point. This produces a disintegration of the briquettes, which makes it totally useless to agglomerate the turnings or the fines. The De Gama process is based on the elimination of air between the particles brought in contact by means of pressure applied in a special way. This pressure is mathematically and automatically equal on each side of the briquette, and the dynamic center of its forces corresponds to the geometrical center of the briquette. This is why the briquettes compressed by the De Gama process have a density which, with certain alloys of copper, is over 7.5.

The machinery with which this process has been made possible, was invented and designed by D. V. De Gama—a mechanical engineer graduated from the Universities of Paris and Madrid. A company has been formed for the exploitation of this process under the name of the Societe des Etablissements De Gama. The De Gama briquettes, made of copper turnings, can be employed in very large percentages, in the loading of the furnaces. In France, where during the greater part of the war there was a big shortage of copper, these briquettes were used in the manufacture of the carriages for the machine guns at St. Denis by the Hotchkiss Company. They were also used by the Societe des Batignolles for the manufacture of gun mounts for the 12 m/m guns; they were utilized for the manufacture of certain copper parts of the breech mechanism of the 75 m/m gun. The De Gama Company organized four factories in France, employing over 600 men, and supplying the most important factories with briquettes of various metals. Mr. De Gama, who is temporarily in the United States, has taken an office at 347 Madison avenue.



DE GAMA MECHANICAL HIGH POWERED PRESS WHICH DEVELOPS A PRESSURE OF 650,000 LBS.

ELECTRIC ENAMELING OVEN INSTALLATION

Cutting an industrial process from four to one day's time is what a manufacturer of bathroom fixtures has done by employing electric heat in baking enamel.

This interesting result has been achieved by Conant Brothers Company, Somerville, Mass., manufacturers of mirrors, cabinets and fixtures for the bathroom, who recently installed an enameling oven equipped with General Electric Company Form G heaters and automatic temperature control. In order to obtain a pure white glass enamel finish on wood or metal, several costs must be applied with great care and carefully dried in a dust-proof room. This process generally required from four to five days' time under the old methods. With the electric oven just installed and shown in the accompanying illustration, this time has been reduced to one day.

The oven is of the box type variety, about 7 feet square, the walls being insulated against radiation heat losses by a two-inch layer of asbestos. Along both sides of the oven, near the floor, are ribbon type heating units with a total capacity of 16 kilowatts. The oven is operated at 150° F.

Fresh air is constantly forced into the oven by an electric blower and forced through the heating units from the piping just above them. This air, becoming saturated with the fumes given off from the drying enamel, escapes through a vent at the top of the oven to the outside air. At the left of the oven may be noted the automatic control panel which, in conjunction with a temperature-control instrument, maintains the desired temperature in the oven. With no overheating of the oven it can readily be seen that no more current will be used than is absolutely necessary and at the same time the work is protected from excessive tem-

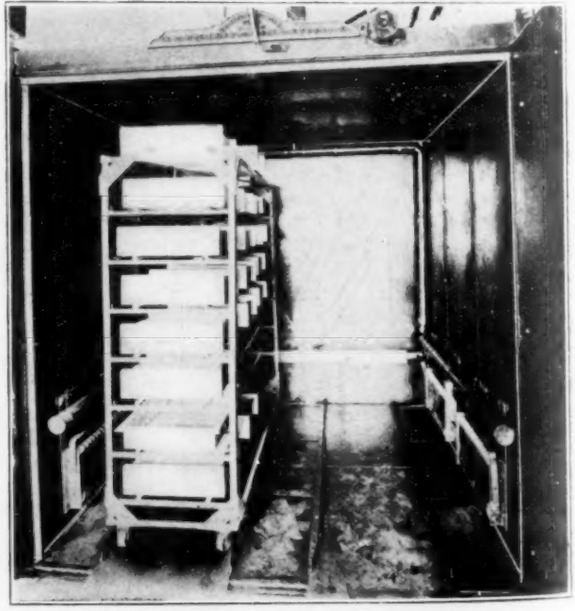


FIG. 1. BOX OVEN FOR BAKING JAPAN ON BATHROOM FIXTURES

peratures that would be harmful. This regulation is possible through electricity.

As there is no combustion with electric heat, there are no possible fumes to discolor the enamel as might occur with other forms of heating. It is stated that the positive control of the temperature and unvarying conditions made it possible to duplicate any given condition with the same results continuously, and that this has done away with all so-called seconds, so wasteful in ordinary manufacturing processes.

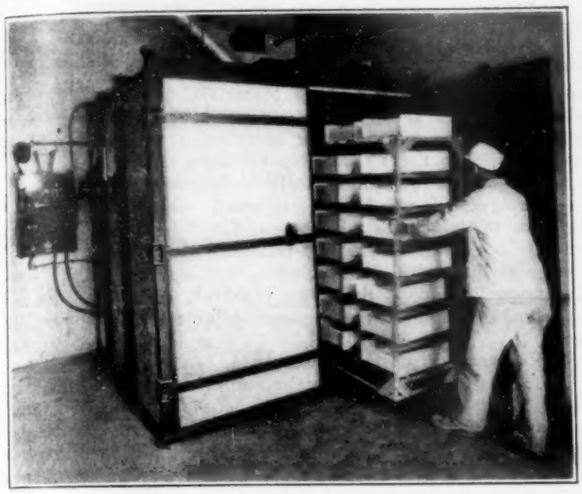


FIG. 2. LOADING RACK INTO FURNACE

LIQUID SULPHUR

The Sulphur Products Company, of Greensburg, Pa., has developed a trade-mark for Liquid Sulphur, the oxidizing agent made by this company for some years. The illustration shows the form of this trade-mark, which will appear on this product hereafter. It is stated that this trade-mark has been put out with

"Liquid Sulphur"

the idea of protecting customers who specify this material and to assure them that they are getting exactly what they want. Liquid Sulphur is distributed all over the United States by plating supply jobbing houses and in Great Britain by the A. A. Chemical Company, Ltd., of London.

GENERAL ELECTRIC EXHIBIT

An interesting feature of the General Electric Company's exhibit at the National Exposition of the Chemical Industry, New York, September 17 to 22, will be an operating model of an electric steam generator developed for utilizing excess electric power and for heating and process work in chemical plants, etc. This, model which was recently constructed, as well as the full-sized units now in operation in a number of plants have attracted wide interest.

There will also be an operating model of the G. E. Induction Furnace for melting metals. Other apparatus to be on view include an automatic arc welding machine in actual operation, a standard air tempering oven, 30 pounds solder melting pot and C. R. 1034 mill type compensator. The automatic welder will be shown in shaft and straight seam welding on a small lathe.

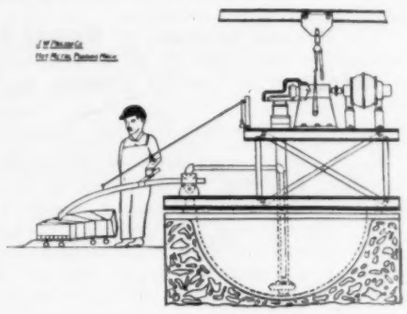
PANGBORN EXHIBIT

The cleaning of the production of the electrified foundry, the biggest feature of the Iron and Steel Exposition at Buffalo, N. Y., September 24-28, 1923, will be by means of sand-blast equipment, manufactured by the Pangborn Corporation, Hagerstown, Maryland. They will have in continuous practical operation complete barrel sand-blast and hygienic cabinet sand-blast installations.

In addition they will have a full display of photographs of different applications of sand-blast equipment, specimens of interesting castings, literature, and data and information available on the use of the metallic abrasives, angular steel grit and Samson steel shot at their booths 67 and 68. The booths which are across the aisle from the Electrified Foundry will be furnished with a number of easy chairs for the convenience and comfort of visitors. John C. Pangborn, Vice-Pres., H. D. Gates, Sales Mgr., and Jesse J. Bowen, District Sales Engineer, will be in attendance.

METAL POURING DEVICE

The J. W. Paxson Company of Philadelphia, Pa., has devised a new appliance for pouring soft, low-melting-point metals like lead, tin, zinc and their alloys. The metal is pumped from the pot direct to the molds, as shown in the illustration. The operator simply guides the spout to the proper mold. The whole outfit is portable and, it is claimed, completely eliminates hand dipping and ladling.



NEW PULLEY COVERING

A new form of pully covering has been developed and placed on the market by the Monarch Belting Company, of Cleveland.

The belt has always been a trouble maker in the shop. In order to keep up production we have had to keep continually at the belt to keep it pulling. We have repaired them, shortened them, spliced them and glued them, and then depended on belt dope to get away from slippage.

And still they always slipped. Steel pulleys and leather belts can never run together without slipping. The pulley is very soon shiny and smooth and offers in itself absolutely no tractive power.

The Monarch Pulley Covering consists of specially manufactured duck, treated with preservative material and is cemented to the face of any kind of pulley by a special cold cement, which hardens overnight. It offers a surface that is perfectly tractive with belting.

Its use, it is claimed, eliminates most of the slippage or the use of belt dope and allows belts to run with less tension, less wear on the bearings and an increased pulling power. It is furnished complete with cement, pulley cleansing compound, and application tools, and can be installed by anyone.

CLEARER MERCURY THERMOMETER

While no fault could be found with a well-made mercury thermometer on the grounds of accuracy, this type has met much criticism because it was difficult to read. Mercury was necessary from the standpoint of accuracy, but nothing could be done to increase the visibility of the mercury.

A new method of tube construction, however, has, it is said, overcome this shortcoming of the mercury thermometer. The feature, known as the Tag-Hespe Red Reading Column, shows a broad red line from the top of the mercury column to the top of the tube. When the mercury rises, it covers more of this red line; when the mercury falls, a correspondingly greater length of the red line is visible. This red line attracts the eye at first glance and it is easy to follow it **down** and take the reading. This feature brings to the accurate mercury thermometer the easy readability of the red spirit thermometer.

The C. J. Tagliabue Manufacturing Company of Brooklyn, N. Y., has secured the sole manufacturing and selling rights of this improvement as applied to all types and forms of mercury thermometers for industrial purposes. It is stated that an exceedingly low extra charge is made for the Tag-Hespe feature.

ASSOCIATIONS and SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

AMERICAN FOUNDRYMEN'S ASSOCIATION

Headquarters, 140 S. Dearborn Street, Chicago, Ill.

The American visitors to the International Foundrymen's Congress, to be held in Paris, France, September 12-16, will be headed by G. H. Clamer, Ajax Metal Company, Philadelphia, Pa., President of the Association. Several American firms will be exhibitors, and among the papers read will be several in English including:

The Bonding Substance of Molding Sand; its Composition, Properties and Tests, by **H. B. Hanley,** Rochester, N. Y.

Magnesium in Foundry Practice, by **H. J. Maybury,** London, England.

NON-FERROUS CASTING COMMITTEE REPORT

R. J. Anderson reported for the committee on Non-ferrous Castings, reviewed the activities of A. S. T. M. Committee B-2 on Non-ferrous Metals and Alloys, with which the A. F. A. Committee is co-operating. Committee B-2 at its meeting recommended that the present tentative specifications on white metals and babbitt be held for another year pending results of investigation by the Bureau of Standards. The methods of chemical standards for nickel, brass ingots, and castings and bronze bearing metals were recommended for adoption as standard. The sub-committee on aluminum and aluminum alloys reported that no new work had been placed before the committee the past year, but that the Federal Specification Board is now working on aluminum alloys and that nothing further will be done until the board completes its work.

OBERMAYER PRIZE AWARDED

The Board of Directors at its June meeting approved the recommendation of the Board of Awards, that the Obermayer prize for 1923 be awarded to Hugh A. Mackie and Charles Parsons of the Homestake Mining Co., Lead, S. Dakota. The winners of the prize are each to be given a clock with silver plate having an appropriate inscription engraved upon it.

Descriptive of the device submitted by Messrs. Mackie and Parsons, it may be stated that the method showed its application to the making of 12-inch chilled mine car wheels.

JOHN A. PENTON MEDAL TO BE PRESENTED TO ENRIQUE TOUCEDA

The American Foundrymen's Association has announced its first award under the John A. Penton Fund established two years ago to provide suitable recognition of conspicuous service to the foundry industry, and a gold medal will be presented at the next convention.

The honor was conferred upon Enrique Touceda, consulting metallurgical engineer and professor of metallurgy at Rensselaer Polytechnic Institute, for his achievements in research and development of malleable iron.

J. H. WHITING MEDAL TO BE PRESENTED TO JOHN HOWE HALL

John Howe Hall, metallurgist for the Taylor-Wharton Company of High Bridge and Easton, Pa., selected to be the first recipient of the J. H. Whiting medal of the American Foundrymen's Association, has been chosen because of his outstanding achievements in metallurgy in the steel casting industry.

PRESIDENT CLAMER OUTLINES FUTURE A. F. A. WORK

The year just closed has been, without doubt, the most successful, all things considered, in the history of our association. Many excellent projects have been inaugurated during the past few years, which it will be my great pleasure to guide during the coming year of my administration and to push forward, with all possible diligence.

The term of one year is so short that in an association such as ours, it is only possible to carry on the work of one's predecessor, a step in advance of the point at which they are taken up.

The new work of importance in our association now being pursued is as follows:

1—Sand research.
2—Making awards.
3—Pattern standardization.
4—Furthering international relations with foreign foundry associations.
5—International grey iron test bar project.
6—Furthering joint activity of our association with the American Society for Testing Materials.
7—Continuing, through our duly appointed representatives, the co-operation between our association and the Bureau of Standards, also the Federal Specification Board.

New work to be immediately undertaken:

1—Reorganization of our technical department under a manager of that department whose function shall be to represent the society in all matters technical and to guide the technical activities of the association, namely, papers, technical discussions, technical meetings, research, etc.

2—Inauguration of a new method for membership solicitation.

3—Research on cast iron test bars.

4—Taking the necessary steps for bringing into unison the A. F. A. specifications with such A. S. T. M. specifications now existing, which cover materials in which the A. F. A. is interested. Also, for adopting such A. S. T. M. specifications as the A. F. A. is interested in for which no A. F. A. specifications now exist.

In this bulletin articles appear covering most of the above activities. Members, through the pages of the bulletin, will be kept in close touch with the progress made with the above listed projects.

Your president appreciates greatly the honor of having been elected to fill the highest office in your association, but he appreciates still more the confidence in him evidenced by reason of your having elected him to fill the office. He trusts that his humble efforts will result in pushing forward the important work of the association to a satisfactory degree.

G. H. CLAMER, President.

AMERICAN ELECTROCHEMICAL SOCIETY

Headquarters, Columbia University, New York

The Fall meeting of the society will be held in Dayton, Ohio, a city which is noted as an engineering, industrial, mechanical and manufacturing center. The meetings will cover from September 27 to September 29, 1923, inclusive.

BRASS FURNACE PRACTICE

Brass furnace practice is of so much importance that it has been decided to conduct a Round Table discussion on this subject at the Fall meeting of the American Electrochemical Society in Dayton, Ohio, September 27, 28 and 29. The discussion will be presided over by Mr. H. W. Gillett, Chief Alloy Chemist of the U. S. Bureau of Mines. Among some of the more important phases of this subject which will be discussed are:

Troubles—of any kind or description.
Applicability of different types of furnaces to different jobs.
Two or three shift operation of furnaces.
Induction furnaces in jobbing foundry work.
Large vs. small electric furnaces.
Refractories.

An unusually large attendance is expected and it is hoped that anyone interested in this subject will attend whether a member or not and join in the discussion.

DISCUSSION ON ELECTROPLATING

Of particular interest to the electroplaters is the announcement of a Round Table discussion on Electroplating. It will be presided over by Walter Fraine, Superintendent of the Electroplating Department of the National Cash Register Company. The many interesting phases of electroplating will be discussed.

SOCIETY FOR TESTING MATERIALS

Headquarters, 1315 Spruce Street, Philadelphia, Pa.

A number of items were by action of the annual meeting referred to letter ballot vote of the membership, as follows:

1. A revision of the Standard Specifications for Hard-Drawn Copper Wire (B 1-15), recommended by Committee B-1.

Adoption of the following tentative standards as standard:

Tentative Specifications for:

2. Pig lead (B 29-22 T), revised as recommended by Committee B-2.
3. Copper Pipe, Standard Sizes (B 42-22 T), recommended by Committee B-2.
4. Brass Pipe, Standard Sizes (B 43-22 T), recommended by Committee B-2.

Tentative Methods of:

15. Chemical Analysis of Nickel (B 41-21 T), recommended by Committee B-2.
16. Chemical Analysis of Brass Ingots and Sand Castings (B 45-22 T), recommended by Committee B-2.
17. Chemical Analysis of Bronze Bearing Metal (B 46-22 T), recommended by Committee B-2.

PROPOSED REVISIONS OF EXISTING STANDARDS

Revisions in the following standards among others were accepted at the annual meeting for publication as tentative:

Metals:

Methods of Chemical Analysis of Pig Lead (B 35-20).

Methods of Testing:

Methods of Mechanical Testing of Metallic Materials (E 1-18).

NEW TENTATIVE STANDARDS

New specifications and methods were accepted at the annual meeting for publication as tentative standards:

Metals:

Methods of Determining Weight of Coating on Zinc-Coated Articles.

Methods of Determining Weight of Coating on Tin, Terne, and Lead-Coated Sheets.

Specifications for Round and Grooved Hard-Drawn Copper Trolley Wire.

Specifications for Soft Rectangular Copper Wire.

Specifications for Hot-Rolled Copper Rods for Wire Drawing.

Specifications for Non-Ferrous Insect Screen Cloth.

Metallography and Methods of Testing:

Definitions of Terms Relating to Methods of Testing.

Method of Verification of Testing Machines.

Methods of Metallographic Testing of Non-Ferrous Metals and Alloys.

Recommended Practice for Photography as Applied to Metallography.

BRITISH INSTITUTE OF METALS

Headquarters, 36 Victoria Street, London, England

The annual meeting will be held in Manchester, September 10-13 1923. The following communications are expected to be submitted:

1. Bolton, E. A., M.Sc. (Birmingham). "The Cause of Red Stains on Sheet Brass."
2. Brownsdon, H. W., M.Sc., Ph.D., F.I.C. (Member of Council). Note on "Brinell Hardness Numbers."
3. Coe, H. I., M.Sc. (Swansea). "The Behavior of Metals Under Compressive Stresses."
4. Endo, Hikozo (Sendai, Japan). "On the Measurement of the Change of Volume in Metals during Solidification."
5. Evans, Ulick R., M. A. (Cambridge). "The Electrochemical Character of Corrosion."
6. Gayler, Marie L. V., M.Sc. (Teddington). "The Constitution and Age-Hardening of the Quarternary Alloys of Aluminium, Copper, Magnesium, and Magnesium Silicide."
7. Hanson, D., D.Sc., C. Maryatt, B.Sc., and Grace W. Ford, B.Sc. (Teddington). "Investigation of the Effects of Impurities on Copper. Part I.—The Effect of Oxygen on Copper."
8. Ingall, Douglas H., M.Sc. (Wednesbury). "Experiments with some Copper Wire; Cohesion a Function of both Temperature and Cold-work."
9. Mundey, A. H., and C. C. Bissett, B.A., B.Sc., B.Met. (London). Note on "The Effect of Small Quantities of Nickel upon High-Grade Bearing Metal."
10. Mundey, A. H., and John Cartland, M.C., M.Sc. (London). "Stereotyping."
11. O'Neil, Hugh, M.Met. (Manchester). "Hardness Tests on Crystals of Aluminium."
12. Portevin, Albert M. (Paris), and Pierre Chevenard (Imphy). "A Dilatometric Study of the Transformations and Thermal Treatment of Light Alloys of Aluminium."
13. Reader, R. C., Ph.D., M.Sc. (Birmingham). Note on "Effects of Rate of Cooling on the Density and Composition of Metals and Alloys."
14. Rhead, E. L., M.Sc. Tech., and J. D. Hannah (Manchester). "Crystallization Effect on Galvanized Iron Sheets."
15. Soldau, Professor P. (Petrograd, Russia). "Equilibrium in the System Gold-Zinc (based on Investigations of Electrical Conductivity at High Temperatures)|"

AMERICAN ELECTRO-PLATERS' SOCIETY

ST. LOUIS BRANCH

Headquarters, care of H. H. Williams, 4156 Botanical Ave., Bell Phone, Grand 1475-W

On August 11th the annual outing at Belleville, Ill. was held. The thermometer stood at 98° in St. Louis, so the old swimming hole" was much in favor in afternoon. After a picnic dinner, several contests were held, and prizes awarded to winners. Supreme First Vice-President E. J. Musick was in charge of arrangements, which assured everyone a good time. C. L. Weygandt, C. Koderhandt and H. Eckhardt of the Belleville members took many to the picnic grounds in their autos and assisted in entertainment. G. Lamkemeyer who has shown real ability as a fisherman was presented with a landing net. Hedley Richards went "3 times faster" while swimming.

The regular program for monthly meetings will begin on Sept. 4.

BRASS MANUFACTURERS

Headquarters, City Hall Square Building, Chicago, Ill.

The next meeting of the National Association of Brass Manufacturers will be held on Thursday, September 13, 1923, at 10 A. M., in the Old Colony Club, Hotel Cleveland, Cleveland, Ohio. Matters of unusual importance are scheduled to come up.

NATIONAL SAFETY COUNCIL

Headquarters, 168 North Michigan Ave., Chicago, Ill.

The Twelfth Annual Safety Congress of the National Safety Council will be held at the Hotel Statler in Buffalo, N. Y., October 1-5, 1923. Information can be obtained from W. H. Cameron, managing director and secretary, at headquarters.

CHEMICAL EXPOSITION

Headquarters, Grand Central Palace, New York

At the 1923 Chemical Exposition, which will be held in the Grand Central Palace, New York, September 17-22, 1923, several events of interest to metal manufacturers and users will be held. Among them are the following:

A motion picture showing the operations of a nickel rolling mill producing sheet and wire (5 reels), by courtesy of the International Nickel Company, New York.

In the student courses program E. A. Turner, of the International Nickel Company, New York, will speak on Nickel and Monel Metal. S. Skowronski, of the Raritan Copper Works, Perth Amboy, N. J., will speak on Copper and Brass as Materials of Construction. Homer Hendricks, of the New Jersey Zinc Company, New York, will speak on Zinc and Zinc Products as Materials of Construction. W. H. Gaylord, of the Quigley Furnace Specialties Company, New York, will speak on Furnace Wall Construction.

Personals

A. J. Huston, of the Surface Combustion Company, New York, will have charge of the Buffalo District with headquarters at 45 Andrews Building.

Laurence Cornelius has been made secretary of the Wolverine Brass Works, Grand Rapids, Mich. Mr. Cornelius was formerly general manager of this company.

F. J. Winder, of the Surface Combustion Company, 366 Gerard avenue, New York, has been appointed manager of the Pittsburgh District with offices at 927 Union Arcade Building.

C. F. Freeman, of the Surface Combustion Company, has been transferred from the position of manager of the Pittsburgh District to that of chief engineer. His address is now 366 Gerard avenue, New York.

Nelson Littell, assistant examiner in charge of Metal Founding in Division 3 of the United States Patent Office since August, 1919, has resigned to engage in the practice of patent law. He will be located at 110 E. 42nd street, New York.

Louis W. Olson, elected vice-president of the American Foundrymen's Association by the board of directors to fill the position left vacant by the resignation of H. B. Swan, was made a member of the board of directors at the Rochester convention. He is very prominent in the non-ferrous metals manufacturing field, being factory manager of the Ohio Brass Company, at Mansfield, Ohio.

Dr. Percy Longmuir, director of research to the British Cast-Iron Research Association, has resigned that position, to which he was only appointed early this year. The reason assigned is a serious breakdown in health and Dr. Longmuir has gone away to the South of England for a long rest. Formally, the resignation will not take effect until November and Longmuir hopes to complete certain bulletins with regard to work he has carried out. His many contributions to technical literature in the proceedings of the Iron and Steel Institute, the Institute of British Foundrymen (of which he was president in 1910) and other societies have made him known throughout the metallurgical world. He collaborated with the late Dr. A. McWilliam in the production of "General Foundry Practice," which is generally recognized as a standard text-book, and he himself published "Elementary Practical Metallurgy."

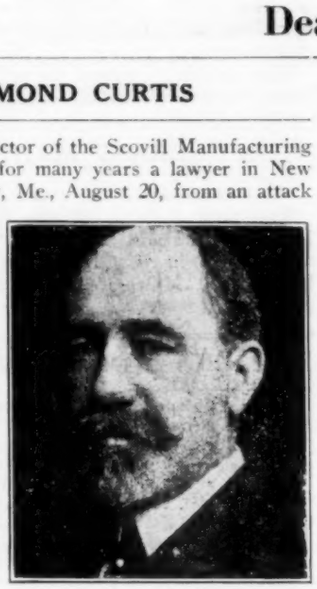
John F. Cunningham, Jr., has been appointed assistant manager of the Production Department of the Schenectady works of the General Electric Company. Mr. Cunningham, in 1901, entered the employ of the General Electric Company in the Armature Department. In 1906, he was transferred to the Turbine Section of the Production Department as production clerk. He was later transferred to the Main Section of the Production Department as contract clerk and later as assistant to the production manager, in charge of Requisition Service. In 1919, he was transferred to the works manager's office in the capacity of special representative.

At the last meeting of the American Foundrymen's Association **Dr. G. K. Burgess,** director of the United States Bureau of Standards, and **Dr. H. Ries,** of Cornell University, were elected to honorary membership. This action was taken because of the invaluable service which these two gentlemen have rendered the association through committee service, particularly in connection with the sand research work.

Deaths

WILLIAM EDMOND CURTIS

William Edmond Curtis, a director of the Scovill Manufacturing Company for several years and for many years a lawyer in New York City, died at York Harbor, Me., August 20, from an attack of heart trouble. He was born in Watertown, June 2, 1855, the son of Judge William Edmond and Mary A. (Scovill) Curtis. He never married. A brother, Henry Holbrook Curtis, was a noted surgeon in New York until his death. His brother, Kingsbury Curtis, and sister, Elizabeth Curtis, survive.



WILLIAM EDMOND CURTIS

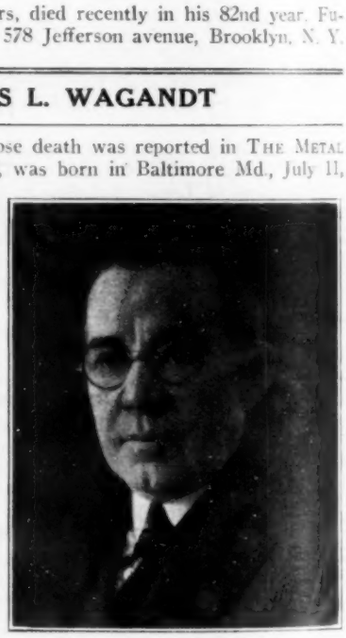
He graduated from Trinity College in 1875 and from the Columbia Law School in 1877, receiving the degree of LL.D. in 1902. He was Assistant Secretary of the Treasury under President Grover Cleveland, a member of the New York Aqueduct Commission from 1892 to 1895, and a delegate to the Democratic National Convention in 1904. In 1895 he conducted negotiations which resulted in the purchase of gold to support the public credit, and went abroad with $31,000,000 worth of bonds issued for the gold. He was a member of the American, New York State and city bar associations, a member of the Union, Century, University, Manhattan and Tuxedo clubs. Besides his home in Watertown he maintained a town house at 399 Park avenue, New York, and a shore place at York Harbor, Me.

WALLACE BRUCE

Wallace Bruce, son of the late David Bruce, the inventor of the machine for typecasting and for many years associated with his brother in the firm of Bruce Brothers, makers of designs and letter-casts for type founders, died recently in his 82nd year. Funeral services were held at 578 Jefferson avenue, Brooklyn, N. Y.

CHARLES L. WAGANDT

Charles L. Wagandt, whose death was reported in THE METAL INDUSTRY for August, 1923, was born in Baltimore Md., July 11, 1858, and spent his entire business life in the metal ware trade. He started as a boy, about fifty-one years ago, with the Keen & Hagerty Manufacturing Company, of Baltimore, and at the time that company was absorbed by the National Enameling and Stamping Company was vice-president and general manager. When the Keen & Hagerty Company was taken over, Mr. Wagandt continued with the new organization as factory manager and shortly afterward was elected as a director, both of which offices he held at the time of his death.



CHARLES L. WAGANDT

Mr. Wagandt invented and improved many of the machines and processes now used in the manufacture of metal ware, the best known being a safety appliance for presses and soldering with gas and compressed air in place of the old charcoal pots. He also held patents on oil heaters and cookers.

In November, 1922, Mr. Wagandt celebrated the fiftieth anniversary of his association with the Keen & Hagerty Company, this record having been made without interruption. He lived to see the business change from a slow hand process to the modern machine one.

NEWS OF THE INDUSTRY

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

WATERBURY, CONN.

SEPTEMBER 4, 1923.

Waterbury brass and metal products will be advertised to representatives from every state in the union at the national encampment of **Veterans of Foreign Wars** at Norfolk, Va., this month. The Connecticut department of the order in co-operation with the Connecticut Manufacturers' Association has arranged for window displays of Connecticut products in Norfolk all during the convention. The past month a representative of the Veterans visited Waterbury and arranged for window displays from all the leading brass and metal factories of this city. Most of the concerns are donating certain of their exhibits as prizes for events in connection with the encampment. The **International Silver Company** has donated a silver cup which will be given to the Norfolk merchant who has the best display of "Made in Connecticut goods."

The claim made by **Miss Grace Abbott** in Chicago recently that Waterbury had one of the largest increases in child labor during the past year of any city in the country has been disputed by local manufacturers. She declared the increase between June, 1922, and June, 1923, to be 800 per cent, based on the number of children between 14 and 16 who had applied to the state board of education for certificates to allow them to work. The explanation offered by local manufacturers is that many children rushed to get certificates and then did not use them, thus making the percentage appear greater than it actually was as many of the children were refused employment by the local shops.

E. H. Yates, secretary of the **American Brass Company,** said: "I cannot understand the authority upon which the assertion that Waterbury's child labor has increased 800 per cent is based. Waterbury's population, both male and female, are principally employed with large manufacturing concerns and there are very few vacancies where youthful laborers might make themselves useful. Obviously if one office had a single boy in its employ and two or three more were added the alarming statement that its child labor increase was 800 per cent would be literally true. Further investigation would show its utter absurdity. Moreover, should a person speaking on welfare problems use that as a basis to demonstrate inefficient labor laws, he would commit a grave error. We have no persons on our payroll under the age of 16."

The **Chase Companies Incorporated** stated: "Neither the **Chase Metal Works** nor the **Chase Rolling Mills** employ any minors. The **Waterbury Manufacturing Company** has taken on 10 minors during the vacation season. Some of these are sons of foremen who asked to have their sons work in the factory for a month or two. All of these minors are employed on light work such as inspecting and packing brass articles and running errands and work eight hours a day, 45 hours a week. They all have school certificates and are working during the summer months with the full approval of their parents and under the strictest interpretation of the laws governing the employment of minors."

The **Scovill Manufacturing Company** stated it had no children under 16 years of age employed and children over that age are accepted only when a distinct need of compensation is proven. The only qualification of this rule is that the company does allow boys and girls with lesser exigencies to work during the vacation period, but the law limits their day to eight hours and their service to definite kinds of occupation. It is unlawful to employ them at specified sorts of machinery.

The offices of the **Ansonia Branch** of the **American Brass Company** were removed to this city this past month in conformity with the new centralization plan of the company. The Torrington offices were removed some time ago. With the removal, 94 persons, office employes, reported here for duty and all office equipment was brought up. The vice-presidents and their assistants hitherto located in Ansonia and Torrington and the selling forces are now in the central office. Treasurer **C. L. Hollister** said that only the actual operating forces would remain at Ansonia and Torrington, including the superintendents and paymasters. The Torrington and Ansonia residents who have been transferred here have been requested to establish their residences here as soon as possible as the company does not favor their commuting to and from their work.

The electric power supply of the **Scovill Manufacturing Company** was temporarily crippled one day last month when one of the three general electric steam turbines at the power house became disabled, through weakening of two of the buckets on the shaft of the turbine. It was estimated at the time that at least three to four weeks would be required to repair the damage but the fact that the necessary buckets were in stock enabled the engineers to put it in shape by the following morning. During the disablement, power was supplied by the **Connecticut Light and Power Company.**

Atty. **Samuel Reich** of Bridgeport has been appointed a special master by Judge **Edwin S. Thomas** in the United States district court to hear the evidence and to make conclusions of fact and law in the case of the **Eastern Brass and Ingot Corporation** of this city. He will decide just what property is or is not covered by the mortgage given by the corporation to the Central Trust Company of Illinois to secure a bond issue of $100,000.—W. R. B.

BRIDGEPORT, CONN.

SEPTEMBER 4, 1923.

Rain failed to dampen the ardor of the 4,000 employees of the **Bridgeport Brass** plants and their families at the annual outing held at the Farm, August 2nd. It required 18 trolleys to transport the employees from the two branches. Under the supervision of the athletic committee a large number of sport events were held for men, women, girls and boys.

Maine woodsmen, now employed by the company, staged a wood chopping contest much to the interest of **Carl F. Dietz,** president of the concern. The winners of the various events were: A. McCloud, wood-chopping; Augustine and Winnie Jackson, girls' 50 yard dash; Dominick Appensia and J. Barney, novelty race; C. Huntley and J. Barney, shoe race; A. McCloud and H. Cartensen, pipe smoking race; A. Pruzinsky and C. Marino, pie eating contest.

The plant of the **Lake Torpedo Boat Company** on Seaview avenue, where submarines have been built for the United States and many other governments for many years, is for sale. Preparatory to complete dismantling of the plant, the directors have broadcast announcements that 60 buildings and 23 acres of land are available for purchase or lease. Only a skeleton organization will be retained by the Lake company, which will not relinquish its evenkeel submarine patents.

Col. Elmer H. Havens has resigned as vice-president and general manager of the **Locomobile Company** and **Edwin Boyd Jackson** has been appointed to succeed him, **W. C. Durant,** president of the Durant Motors, announced last month.

Leaders of local industries rested from their cares of business August 11th, at the annual outing of the **Manufacturers' Association** held at the property of the Bridgeport Hydraulic Company's reservoir. A clambake, with corn on the cob, lobsters and chicken was served. The members made the trip in cars. Trapshooting was enjoyed following the dinner. —W. R. B.

TORRINGTON, CONN.

SEPTEMBER 4, 1923.

The main office of the **Torrington Branch** of the **American Brass Company** was moved to Waterbury on August 18 for consolidation with the Waterbury and Ansonia offices. Most of the Torrington workers will commute between Torrington and Waterbury for two or three months or until the permanency of their places in the new office is assured.

The big new addition to the plant of the **Union Hardware Company** is almost completed.

Torrington plants are all working full time and the outlook continues bright. One of the largest plants, it is said, has enough orders on hand to keep it busy until spring. Most of the others are receiving orders at a rate which presages a busy winter.

The **Union Hardware Company** has purchased the Drake property, so-called, adjoining its present property at Migeon avenue and West Torrington road. The price is said to have been in the neighborhood of $16,000.

W. W. Cotter, formerly in charge of the **Turner & Seymour** plant but now with the **American Brass Company** at Ansonia, has sold his residence on Migeon avenue to Samuel A. Morgan, works manager of the Excelsior plant of the Torrington Company. J. H. T.

NEW BRITAIN, CONN.

SEPTEMBER 4, 1923.

There is a slight depression in the metal industries in this city, although it is not sufficient to be at all alarming. The fact is that in practically every line of industry here the incoming orders are showing a marked decrease and with this fact in mind, production is not being speeded up as formerly. Some of the larger concerns are making slight reductions in their working personnel and also are curtailing the working hours in individual departments. This is true at the **North & Judd Manufacturing Company,** makers of buckles, harness trappings, etc., where several departments have gone onto a shorter working schedule and a number of employes have been released. The **Stanley Works** also has cut down its working force slightly and the same is true at the **Fafnir Bearing Company, Hart and Cooley** and several other plants. Those in charge, however, explain definitely that this is not a slump, but simply a temporary change brought about by general conditions.

The possibility of a coal strike is not apparently causing the local manufacturers any great apprehension, but as usual during the summer months they have been filling their yards and bins so that even in the event of a strike it would be quite a long time before they would feel the pinch of a fuel shortage.

Incoming salesmen report conditions about the country to be practically normal for this time of the year insofar as builders' hardware is concerned. Orders received are for smaller lots than usual, however, though the average retail order is about normal. H. R. J.

ROCHESTER, N. Y.

SEPTEMBER 4, 1923.

The month just closing has been one of the quietest in business circles of the present year—in fact it has been a typical August. With inventories and vacations it is not surprising that the let down in manufacturing has been marked. Inquiry today among the metal-using industries revealed the fact that all are preparing for a sharp increase in activity after Labor Day. There has been an unusual feeling of dullness in the brass and copper lines of late, demand having fallen almost to a standstill. A gradual reaction is expected by the brass foundries within a brief period, and after October 1 business will probably hum. Leading manufacturers are quite optimistic when discussing future business prospects, and a majority feel that unless the threatened coal strike does not materialize a season of unusual activity is in sight.

The new plant of the **Lisk Manufacturing Company, Inc.,** at Geneva is about ready for occupancy. This concern's main industry is at Canandaigua and a branch exists at Newark, N. J. The new Geneva plant will employ 100 hands at the outset. The company makes aluminum and enamel ware. G. B. E.

TRENTON, N. J.

SEPTEMBER 4, 1923.

All the metal industries of Trenton suspended operations for three minutes during the funeral services of the late President Harding on August 10. During that time many of the employes bowed their heads in honor of the dead executive.

The **Union Electric Company, Inc.,** of Trenton, N. J., has been placed in the hands of receivers. Action calling for receivers was instituted by **Blake & Johnson,** of Waterbury, Conn., and will act as a moratorium against two pending suits aggregating $31,000. The latter represents creditors having $50,000 in claims. Arthur H. Wood and William J. Peacock, of Trenton, were named receivers by Federal Judge Runyon. The defendant's liabilities total $287,000, while the assets reach the sum of $491,000. One of the suits pending against the company was brought by the **Waterbury Brass Goods Company, Waterbury, Conn.,** which has a claim for $17,000.

The **United States Cutlery Company,** of Mill and Main Streets, Belleville, N. J., was recently incorporated at Trenton with $300,000 capital stock to manufacture, trade and deal in all kinds of cutlery and edge tools including knives, razors, scissors, augers and meat choppers. The incorporators are Louis Spielvogel, Miriam S. Klein and Samuel L. Kiener, all of 20 Clinton street, Newark, N. J. N. Pohly Myers is the agent of the company.

Universal Self-Lubricating Bearing Corporation has been incorporated at Trenton, with 2,500 shares no par value, to manufacture bearings. The incorporation papers were filed by Edward T. Murdock of New York City.

Standard Electric Supply Company, to deal in electrical supplies, at Ocean City, N. J., has been incorporated by George D. Richards with $10,000.

Oliver O. Bowman, of the **Jordan L. Mott** Company, Trenton, and a prominent banker, recently celebrated his 85th birthday at the home of his son, Robert K. Bowman, Spring Lake, N. J. The event was observed with a family dinner. Mr. Bowman is treasurer of the Mott Company and is also an official of the Broad Street National Bank, Trenton, N. J. It was through the efforts of Mr. Bowman that the J. L. Mott Company removed to Trenton from Mott Haven, N. Y.

Walter H. Orr, of 50 Oak Lane, Trenton, president of the **Orr Machine Guarding Company,** who disappeared recently after leaving a note that he was in financial difficulties, was later located in New York State. After meeting his family he went to the Catskills to secure a rest from a nervous breakdown. The Orr Company, it is said, is doing a good business, but lacks the ready cash.

Plans have been announced by the **Keystone Watch Case Company** for a combination of its Newark, N. J., plant with the big factory at Riverside, N. J., and arrangements are now being made to move to this town. The Newark plant will be closed and much of the machinery there removed to Riverside. The company announces that many new employes also will be needed at the Riverside plant when the capacity is increased. C. A. L.

BOSTON, MASS.

SEPTEMBER 4, 1923.

Most metal lines continue dull. A few foundries and shops are doing good business but on the whole operations have slowed down to a considerable extent. Fall orders have not yet made their appearance in any volume and new business at present is very scanty. Most foundrymen are optimistic, however, and feel that it is rather early to expect a substantial pickup in new business. The next six weeks should give some indication as to what may be expected for the fall and winter months in this section. Machine lines have shown the same tendency to drag as has the metal trade.

Among the newly incorporated concerns are the following:

Malden Socket Company, Inc., Boston; electrical goods; capital, $50,000; incorporators, Raymond V. Coffey, Medford; Joseph E. Coffey, Medford; Lester W. Edwards, Arlington.

Underwood Machinery Company, Boston; metals; capital, $100,000; incorporators: William K. Underwood, Newton; Frank E. Underwood, Newton; Thomas J. Berry, Dorchester.

Wilson & Robinson, Inc., Salem; electrical supplies; capital, $25,000; incorporators: George A. Wilson, J. A. Robinson, and Robert W. Hill, all of Salem.

The **Marine Engineering Company** of South Boston has been sold at public auction, because of bankruptcy, for $13,400. Among other things the sale included a large assortment of tools, 4,000 pounds of copper tubing and 7,500 pounds of metals.—C. W. R.

PROVIDENCE, R. I.

SEPTEMBER 4, 1923.

Early in the month nearly half a hundred manufacturing jewelry plants that had been closed in this city and the Attleboros for from one week to one month for the annual vacation and stock accounting period, resumed operations, the manufacturers expressing themselves as pleased with the indications of increasing demand for the products of their plants that are to be seen. They expect a busy season up to and possibly after Christmas demands have been satisfied. It has been a number of years since manufacturing jewelers have been hard pressed for goods. At present the call has been heavy for machine made chain of the better grades. Contrary to labor market conditions during the past three years, it is said that expert chain machine operators are in great demand and very hard to find. Expert jewelers on silver novelties are also needed.

The employes' committee of the **R. F. Simmons Company,** manufacturing jewelers at Attleboro, early in the month informed the more than 300 workers for the firm that the company had granted a five per cent dividend of the profits of the concern for the months of May, June and July and this bonus was paid the employes when the factory closed on the 11th. This participation in the profits is part of the regular profit-sharing scheme of the company and has been followed for several years.

Doyle & McCormack Manufacturing Company, to be located in Providence for the manufacture of jewelry, has been chartered with a capital stock of $25,000, consisting of 250 shares of common stock at $100 each. The incorporators are John J. Doyle, George E. McCormack and James E. Brennan.

Many of the men who have been discharged from the Newport Torpedo Station by the United States Government have found other occupations in and around Newport. **W. P. Hunt** has established himself in business as an electroplater on Hunt's Court, that city, under the firm name of **The Newport Plating and Polishing Company** and is already doing a thriving business. Much of the work that he is doing has heretofore been sent out of the city to be done.

The co-partnership heretofore existing between **Fred Smith** and **Frederick C. B. Strong** under the firm name of the **Beverly Electro-Plating Company,** at 74 Clifford street, has been dissolved, Mr. Smith disposing of his interests to Mr. Strong, who will continue the business under the same name.

Harry Grant, on Saturday, July 28, completed 65 years of service for the **LaStag Company** of North Attleboro and its predecessors. The concern presented him a substantial check and assured him of a life position with the firm. Mr. Grant started working for the firm when it was known as the Stanley Freeman Company.

The employes of the **Bugbee & Niles Company**, manufacturing jewelers of North Attleboro, enjoyed their annual vacation last month at the expense of the company. When the factory closed Friday evening, August 3, all of the employes were notified that the firm would pay them for the coming weeks as though they were working. The firm has made it a practice to do this for some years and its generosity is highly appreciated. W. H. M.

DETROIT, MICH.

SEPTEMBER 4, 1923.

Conditions in the brass, copper and aluminum business have shown a decided upward trend during the last two or three weeks. While there has been but little change in the plumbing supply business there is a decidedly better tone in the automobile accessory business due to the big concerns here starting on their fall and winter campaigns.

Manufacturing jewelers also are busy on fall deliveries with prospects of one of the best seasons they ever have experienced. There are no labor disputes, and the highest wages are being paid. The only handicap just at present is a shortage of skilled mechanics, although this is not so acute as it was earlier in the summer.

The **Vanderput-McLaughlin Company** has opened headquarters in the Penobscot building as manufacturers and representatives of foundry equipment and supplies. Members of the firm are P. G. Vanderput, at one time connected with the Ford Motor Company, and C. B. McLaughlin, who also has been identified with the automobile industry here for the last fifteen years.

The **Wolverine Brass Company,** Grand Rapids, it is reported, has called for payment of its outstanding $84.200 6 per cent bonds, issued in 1915, as a preliminary to a new first loan of $250,000 to be offered in the form of 6 per cent serial bonds. The purpose of this loan, it is said, is to finance a large addition and to refund what is left of the old loan. The 1915 bonds will be redeemed at 102½, it is said.

The **Michigan Copper and Brass Company** at 5851 West Jefferson avenue, has obtained a permit to erect a two-story reinforced concrete shop on Jefferson avenue, between Fort Wayne and Campbell avenue, at an estimated cost of $37,800. A building permit also has been issued to the Detroit Lubricator Company, 5938 Trumbull avenue, for a one-story storage bunker to cost $9,000.

The **International Lamp Company** has been reorganized at Jackson, Mich., and Webster Stone, president and general manager of the Furniture Studios, Inc., Grand Rapids, has been elected president; John L. Green, vice-president, and Henry Lutzenkirchen, secretary-treasurer.

The **Great Western Smelting & Refining Company**, whose headquarters are in Chicago, is erecting a new warehouse and smelting plant on Russell street, near Woodland avenue, Detroit. F. J. H.

INDIANAPOLIS, IND.

SEPTEMBER 4, 1923.

A display of products of the **Seward Foundry Company,** Bloomington, Ind., has been in the window of the Chamber of Commerce for the last week. The exhibit of products was based on a display of the mould, and rough and finished products, showing the process through which an article must go before it is considered finished. Probably the biggest object and product shown was that of the channeling machine screw. It is four feet in length and two inches in thickness. Other articles in the exhibit included chisels, rough brass casting, a diamond saw nut, andirons and grate basket, sand pump shaft, fire escape step, double ratchet wheel. For the most of the articles mentioned, the mould, rough casting and finished product were shown.

William P. Cangany, of the **Cangany Plating Company,** Indianapolis, has announced that the firm has opened a new foundry department in connection with the plating and polishing departments. Brass, aluminum and other castings will be manufactured in the new department, Mr. Cangany said. A machine shop will be operated in conjunction in order that the castings may be machined without undue delay and difficulty.

The **Hays Brass and Aluminum Foundry Company** has been incorporated to do business in Michigan City with a capital of $100,000, $50,000 preferred stock. Joseph W. Hays, Alva F. Orcutt, Philip T. Sprague and Robert B. Jones are the directors of the company.

The **Modern Brass Foundry Company, Inc.,** 1026 Kentucky avenue, Indianapolis, filed suit in voluntary bankruptcy in Federal court recently listing liabilities at $14,763.66 and assets at $4,648.11.

PITTSBURGH, PA.

SEPTEMBER 4, 1923.

Activities in the metal industry continue to be very active throughout Pennsylvania.

Reports submitted to the board of directors of the **National Fireproofing Company** by President H. M. Keasby, for the six months ended June 30, indicated the operations for that period were very satisfactory and show profits comparing favorably with any similar period.

Gas range jobbers report business temporarily dull. Sales

are expected to be excellent in the fall, the busiest season of the year. Inquiries are coming in in fair volume and indicate that buying will start early in September.

Sheet brass and copper dealers report a fairly active business during the month of August, although somewhat slower than a few months ago. Builders are large consumers of sheet copper, which is used for roofing and spouting. Prices are holding firm and deliveries are improving. H. W. R.

MONTREAL, CANADA

SEPTEMBER 4, 1923.

The majority of Montreal metal working and allied trades report good business during the past month with prospects of improvements. While summer slackness is having its effect in many lines, manufacturers and dealers in metals are far from pessimistic, although they are pursuing a hand-to-mouth policy and large orders for metals are few. The conservative attitude on the part of purchasers is reflected in the producing end by manufacturers "making haste every slowly." The market for scrap metals is slow this month and further reductions in price have taken place. One large firm gives the opinion that trade in the scrap metal line will show improvement in September.

The **Canadian Car and Foundry Company** reports another large order for car and coach equipment from the Canadian National Railways which amounts to approximately three million dollars. Business so far in the fiscal year of this concern shows a very large increase. The **Royal Silver Company,** Craig St., is fully employed. The **Northern Electric Company** is running overtime on telephone and electrical supplies. P. W. B.

BIRMINGHAM, ENGLAND

AUGUST 17, 1923.

The present position of the non-ferrous metal trades in this country is one which causes some anxiety. In most branches business has fallen off. Holiday influences partly account for this. But there are many grounds for apprehension.

As far as builders' hardware is concerned, the lack of home business has been largely compensated by overseas requirements, which up to the present have continued strong, with a tendency, in some of the export markets, to increase. South African inquiries, amongst others, have latterly shown a considerable improvement. Cabinet brassfounders are not so well employed as they were two or three months ago, but the falling off is chiefly in the home trade. Growing interest is being shown by the brass and other non-ferrous trades in business with the Irish Free State, which now ranks in the official trade statistics as a foreign market, having its own customs barrier. With the North of Ireland, which, though it has its own Parliament, is still within the British customs area, and enjoys more settled political conditions, trade from this district is steadily increasing. Travelers' reports from Southern Ireland, however, foreshadow good business there as soon as the elections are over. A curious complaint has come to hand from this part of Ireland. It was suggested to the Free State Government that a small tax on imported brass-work would tend to increase home employment. The only result up to the present is a tax of £3 14s. 6d. (about 20 dollars) per gallon on lacquer, which, even with such heavy protection, cannot be made profitably within the Free State and is sold in England at from 2¾ to 4½ dollars. At the same time all lacquered brass is admitted without duty. This is regarded as a serious setback to the development of a Free State brass foundry industry.

The lamp trade, the aluminum trade and the brassfounders continue to derive a large amount of employment from the activity of the automobile, motorcycle and pedal cycle trades. In the metal bedstead trade, price control for several years before the war was successfully maintained. This week the Bedstead Manufacturers' Federation, which has its center in Birmingham, completely withdrew its official price-list and its members are now free to defend themselves against the growing number of price-cutters in the trade by quoting what prices they choose, whether in the home or in the export market. No secret is made of the fact that the change of policy has been forced to a great extent by the competition of the United States, which of late has been growing in strength in all parts of the world, not excluding the British Overseas dominions.

A considerable amount of curiosity was caused a week or two ago by the posting in the Birmingham Exchange of the following announcement: "It has been brought to the notice of the Committee of the Non-Ferrous Metal Section that certain deliveries of brass turnings have recently been tendered containing a considerable percentage of sand, presumably added. This notice is put up for the information and guidance of members."—G.

Business Items—Verified

The **Hamilton Plating Works** are now located at 555-557 West 125th street, New York, where they specialize in automobile and plumbing work.

Ascione Electro Plating Company, 223 18th street, West New York, N. J., now occupies the entire new building at this address, specializing on refinishing brass beds and nickel work.

The **Matthiessen & Hegeler Zinc Company** announces the removal of its New York office to Suite 812, Trinity Building, 111 Broadway. J. L. Glover, eastern sales manager, is in charge of this office.

General sales offices of the **Keokuk Electro-Metals Company** have been moved to Keokuk, Iowa, where furnaces and executive offices are located. This firm operates the following department: smelting and refining.

The **Oriental Rouge Company,** a corporation of Bridgeport, Conn., manufacturing buffing and polishing composition for silver and other metals, has been dissolved and the business reorganized as a partnership of P. J. and J. P. Onkey.

Armed bandits held up and robbed the paymasters of the **Penn Metal Company,** Boston, Mass., recently, of about $3,900 of the company's payroll and escaped after a running gun fight. The leader of the bandits has since been captured by the police.

The **Standard Underground Cable Company,** Westinghouse Building, Pittsburgh, Pa., has awarded a general contract to the Dinwiddie Construction Company, San Francisco, Cal., for a new two-story plant, 125 x 300 ft., at Emeryville, Cal., to cost $200,000.

Work is progressing rapidly on the new factory of the **American Chemical Paint Company** at Ambler, Pennsylvania. The building, designed especially for the manufacture of A. C. P. rust-removing and preventing chemicals, will be occupied about November 1, 1923.

Johnson Gas Appliance Company, Cedar Rapids, Iowa, announces that it has taken over the manufacture and sale of the Moore self-cleaning rake. On July 1st this company acquired all equipment, stock, patent rights, etc., of the Moore Self-Cleaning Rake Company of Cedar Rapids.

The **Massillon Aluminum Company,** Massillon, Ohio, manufacturers of aluminum ware, has commenced the erection of an addition which will add 20,000 square feet to its present floor space and triple the company's output. It operates spinning, stamping, tinning and polishing shops.

The **Kauffmann Metal Products Company,** Bellefontaine, Ohio, manufacturer of flywheel gear rings, has purchased, at auction, the plant of the Modern Glass Company, Toledo, for a branch factory to take care of increasing business. The Toledo plant will employ about 300 men. J. S. Kaufmann is president.

The **California Metal Enameling Company** has engaged Hamm & Grant, Inc., industrial engineers, 607 Ferguson Building, Los Angeles, Cal., to design and construct an addition to its plant on East 51st street, Vernon. The new build-

ing includes an addition 60 x 75 ft., also a wood frame truss roof building 50 x 120 ft.

The **Macdonald Wire Goods Company, Ltd.**, Drummondville, Que., Canada, has completed a new brick factory, 75 x 260 ft., and proposes to bring out new lines of wire and stamped kitchenware early in the fall. J. S. Macdonald is general manager. This firm operates the following departments: tool room, japanning, stamping, tinning, lacquering.

The **Erie Can Company,** 816 West Erie street, Chicago, Ill., recently incorporated with $10,000 capital stock, will specialize in the manufacture of square cans, tubes and punch press work. The company has leased 10,000 sq. ft. of floor space at the address given. This firm operates the following departments: japanning, stamping, soldering, lacquering.

The **Scott & Harsted Manufacturing Company,** Chicago, Ill., has been taken over by the Walter H. Scott Manufacturing Company, Inc., to manufacture polishing machines, special machinery, drapery, hardware. This firm operates the following departments: brass machine shop, tool room, grinding room, japanning, stamping, polishing, lacquering.

Work will soon be commenced on three new foundries by the **Cadillac Motor Car Company,** a division of the General Motors Corporation, Detroit, Mich., to be equipped for the production of aluminum, brass, gray iron and other metal castings. The structures are estimated to cost in excess of $400,000. This firm operates the following departments: brass and aluminum foundry.

The **Canadian Mead-Morrison Company, Ltd.**, Montreal, Canada, has recently purchased considerable new equipment and machinery for its plate shop, including rolls and gate shears and electric welding machines. The company can now handle sheet metal up to 8 ft. wide. This firm operates the following departments: brass machine shop, tool room, grinding room, casting shop, brazing, rolling mill.

The **Kirsch Manufactury Company,** Sturgis, Mich., manufacturers of curtain rods, has just opened a large, new, model factory unit, which has a number of features that make it quite unique and unusual. The new building has clubrooms which include bowling alleys, swimming pool, shower baths, combination auditorium, gymnasium and ballroom, cafeteria, dining room, roof garden, billiard room and reading room.

The **Allis Manufacturing Company,** 198 Milwaukee street, Milwaukee, Wis., manufacturer of brass and aluminum castings, has increased its capital stock from $50,000 to $75,000 and will supplement its equipment to some extent. Details have not been issued, however. This company specializes in vanadium bronze. The following departments are operated: brass, bronze and aluminum foundry, grinding room, casting shop.

Erection of a factory building is planned by the **Norwalk Enamel Products Company,** Norwalk, Ohio, which recently was incorporated with a capital stock of $500,000. The plant will contain 70,000 square feet of floor space and will house 6 furnaces. Vitreous enameling of all kinds will be engaged in and the company is in the market, and desirous of hearing from manufacturers of equipment needed in an enameling plant.

The **Armstrong Cork & Insulation Company,** Pittsburgh, Pa., announce the establishment of a warehouse in connection with their Detroit, Mich., office, where a complete stock of Nonpareil insulating materials are now being carried. This will greatly facilitate service to the Company's customers in Michigan and Northwestern Ohio. The new office and warehouse, in charge of Mr. W. C. Rasch, are located in the Cass Building, 453-457 Fort Street, West, Detroit, Mich.

INCORPORATIONS

New York Brass & Iron Company of Spokane, Washington, has been incorporated with a capital stock, $50,000; incorporators, Leo J. Binder, A. E. Binder and Edna M. Binder.

The **Cagan Foundry Company,** Brooklyn, N. Y., manufacturer of metal castings, has been incorporated with capital stock of $10,000, and has taken over the foundry of the Apollo Foundry Company, Brooklyn.

Pacific Brass & Hardware Manufacturing Company, Los Angeles, Calif., manufacturers of all kinds of hardware, has been incorporated under the laws of Delaware. This firm operates the following departments: brass, bronze foundry, grinding room, casting shop, stamping, polishing.

Standard Aluminum Castings Corporation, Lansing, Mich., has been incorporated with a capital stock of $10,000, to manufacture aluminum and other metal castings. This firm operates the following department: aluminum foundry.

The **Superior Metal Company,** Bethlehem, Pa., has been chartered with a capital of $40,000 to operate a plant for the production of metal products. A factory has been completed on Park avenue and L. & N. E. R. R., and has been in operation since August 25. This firm operates the following departments: japanning, polishing, lacquering.

BUSINESS TROUBLES

Delaware stockholders in the **American Bronze Company,** whose plant is at Berwyn, Pa., have been notified that a petition asking that the company be declared insolvent was presented in Chester County Court recently and a decree was granted by Judge William Butler, appointing Robert O. Sperry, general sales manager of the company, as temporary receiver. R. L. Dollings Company is a creditor to the extent of $375,000. $400,000 in preferred stock is held by more than 600 small stockholders in Delaware, Maryland and Pennsylvania. The company manufactured bronze castings and specialized in non-granular bronze bearings.

Another subsidiary corporation of the **R. L. Dollings Company,** Philadelphia, Pa., was declared insolvent recently in involuntary petitions in bankruptcy filed against them in the poration of Philadelphia, Pa., manufacturers of plumbing supplies.

INTERNATIONAL NICKEL COMPANY

CONSOLIDATED GENERAL PROFIT AND LOSS STATEMENT
THREE MONTHS ENDING JUNE 30, 1923

Earnings		$594,029.03
Other Income		52,355.38
Total Income		$646,384.41
Administration and General Expense	$ 92,247.53	
Reserved for Federal and Franchise Taxes	38,237.00	130,484.53
Net Operating Income		$515,899.88
Depreciation and Depletion	$286,510.07	
Expenditures in Connection with Dismantled Plant	24,587.01	311,097.08
Profits		$204,802.80
Preferred Dividend No. 71, Payable August 1, 1923		133,689.00
Balance		$ 71,113.80

BRASS RAILS FOR SODA FOUNTAIN

Brass rails were used on the soda fountain of the Cunard liner Aquitania. It was stated in the daily press that the passengers were astonished at the sight, brass rails having been associated with ante-prohibition days. The "bar" was discontinued for lack of patronage.

NEW ROD AND WIRE MILL IN CHICAGO

The Brenner-Moxley-Mervis Company, care of the American Insulated Wire & Cable Company, 954 West Twenty-first street, Chicago, is building a plant for the manufacture of copper rods and drawn copper wire. Present plans call for the consumption of 10,000,000 pounds of copper a year.

The new company is headed by Nathan T. Brenner, president of the American Insulated Wire & Cable Company. The vice-presidents are William J. and George T. Moxley. N. T. Brenner, Jr., and Meyer B. Mervis, the American Insulated Wire & Cable Company, are treasurer and secretary of the company.

INDUSTRIAL HEATING COURSE

Twenty central station representatives have completed the course in Industrial Heating offered by the General Electric Company in co-operation with the National Electric Light Association. The course covered lectures on industrial heating design,

applications and general engineering problems with inspection of various installations and took place from May 14 to 26 at the Schenectady and Pittsfield works of the company.

DURALUMIN AIRSHIP GIRDERS RELIABLE

The ability of the framework girders of the new Navy airship ZR-1 to carry the loads for which they were designed has been shown by tests conducted at the Bureau of Standards during the past year. In these tests duplicates of the types of girders to be used were subjected to loads sufficient to break them and of the same nature as those to which they would be subjected in the airship. In all, 147 such girders were tested.

The results of these tests were remarkably consistent, both as to type of failure and breaking load. Practically all the failures were elastic in character. They depended upon the stiffness of the material, and were not the result of poor workmanship or defective material. The tests give assurance as to the strength of the principal structural parts of the airship and have furnished data of value in the design of such girders in the future.

The girders were made at the naval aircraft factory in Philadelphia, and are of duralumin, which is an alloy of aluminum and copper. They are remarkably light and strong. A ten-foot length of one of them can be easily lifted on a man's little finger, yet it is so strong that if supported on its ends it can carry all the men who can find room to sit on it. Such lightness is required in airship construction because it takes more than 13 cubic feet of gas to lift each pound of weight, and the ZR-1, which is one of the largest airships in the world and is as long as a dreadnought, will weigh little more than a single Pullman car.

METAL STOCK MARKET QUOTATIONS

	Par	Bid	Asked
Aluminum Company of America	$100	$465	$510
American Hardware Corporation	100	58	60
Anaconda Copper	50	40⅝	40⅞
Bristol Brass	25	8	12
International Nickel, com.	25	12⅞	13
International Nickel, pfd.	100	78	79
International Silver, com.	100	60	...
International Silver, pfd.	100	102	105
National Conduit & Cable	100	¼	½
National Enameling & Stamping	100	64	64⅝
National Lead Company, com.	100	126	129
National Lead Company, pfd.	100	111¾	113
New Jersey Zinc	100	150	152
Rome Brass & Copper	100	115	125
Scovill Manufacturing Company, new	..	180	185
Yale & Towne Manufacturing Co., new	..	62	64

Corrected by J. K. Rice, Jr., Co., 36 Wall Street, New York.

OPPORTUNITIES FOR SIMPLIFICATION

More than 1,000 outstanding opportunities for the elimination of economic waste through the simplification of varieties and sizes of products are presented in the first analysis of findings in the survey of simplification opportunities which has been carried on during recent months by the American Engineering Standards Committee at the request of Secretary Hoover of the Department of Commerce. This is in the form of a summary of answers to a questionnaire sent out by the American Society of Mechanical Engineers, one of the member-bodies of the A. E. S. C., to selected lists of its membership which includes all members of its professional division, and shows 123 suggestions of important standardization opportunities in the automotive and aircraft industries; 115 opportunities in building material industries; 54 opportunities among electrical appliances and supplies; 291 opportunities in tools and other machine shop equipment; 64 opportunities in paper, catalogs, books, and printing; 200 opportunities in boilers, valves, pumps, pipe supplies and kindred products; 37 opportunities in the railroad field, and 191 opportunities in miscellaneous industries.

Among the materials, simplification of which was suggested in the answers to the A. S. M. E. questionnaire, are the following:

AUTOMOTIVE INDUSTRY

Automobile battery sizes; lead type storage batteries; automobile body hardware; automobile body parts; automobile bodies; automobile carburetors.

BUILDING INDUSTRY

Locks, latches, builders' hardware.

ELECTRICAL INDUSTRY

Lighting fixtures; electrical vacuum cleaners.

MACHINE SHOP

Bronze bushings; core oils; wire and sheet metal gages.

MISCELLANEOUS

Acetylene torches.

POWER

Fire hydrant and hose connections; fire plugs, service cocks, valves; valves (all sorts).

TRADE PUBLICATIONS

Foundry and Plating Supplies. Catalog No. 9 Jr., issued by Frederic B. Stevens, Inc., Detroit, Mich. It covers a complete line of buffing compositions, polishers' supplies, platers' supplies and equipment, and includes interesting and useful data at the back of the book on cleaning, plating and coloring of metals.

Alundum Safety Threads. A booklet issued by the Norton Company, Worcester, Mass., showing Alundum safety treads installed on all stairways leading from the main floor of the New Hotel Statler, Buffalo, N. Y.

River Shipping and Industry. A booklet issued by the American Rolling Mill Company, Middletown, Ohio. It is a compilation of historical and river shipping data on the Ohio River and its tributaries.

Electro-Chemical Deposition. A booklet issued by the Fletcher Electro Salvage Company, Ltd., 3 Penarth Street, Old Kent Road, S. E. 15, England, covering the Fescol process which builds up worn out parts by electro-deposition.

"How to Build up Furnace Efficiency." A booklet abstracting a book of the same title by Jos. W. Hays, Michigan City, Ind., on the importance of fuel conservation.

"Zinc Is Zinc." A booklet issued by the American Zinc Institute, 27 Cedar Street, New York, containing excerpts from several recent issues of "Zn."

Rome. A folder issued by Rome Manufacturing Company, Rome, N. Y., telling why Rome is a good city in which to locate a manufacturing plant.

"Home, Sweet Home." A folder issued by Copper and Brass Research Association, 25 Broadway, New York, on the advisability of planning repair-proof houses.

Plating and Buffing Supplies. A price-list issued by George W. Kyle & Company, Inc., Grand and Thompson streets, New York, on materials used in plating and buffing departments.

Grinders, Buffers, Drills and Die Sinking Tools. Bulletin G-3, issued by the Stow Manufacturing Company, Inc., Binghamton, N. Y., describing the motor-driven grinders, buffers, drills and die sinking tools made by that company.

Dings Magnetic Separator. A folder issued by Dings Magnetic Separator Company, 775 Smith Street, Milwaukee, Wis., on their high intensity magnetic separator.

Charging Equipment for Vehicle Motive-Power Batteries. Bulletin No. 43976, issued by the General Electric Company, Schenectady, N. Y., describing this equipment.

Cleaning. An article reprinted from Printers' Ink entitled "Renders a Service and Sells a Product on the Side" by August Belden, distributed by the Oakley Chemical Company, New York. The article describes the policies of that company.

Rail Welding. A new Thermit Rail Welding pamphlet, issued by the Metal & Thermit Company, New York, which brings up to date the whole subject of Thermit rail welding to cover the many recent improvements in economy and efficiency.

Electro-plating Equipment. New style proposal forms containing numerous large illustrations of belt drive generators, motor generator sets, mechanical electro-plating apparatus and chain conveyor electro-plating equipment, made by the Hanson and Van Winkle Company, Newark, N. J. It is intended, when making quotations on one or more of the articles illustrated, to bind these in a folder together with the regular typewritten letter form quotation. The illustrations are unusually clear and attractive.

Review of the Wrought Metal Market

Written for The Metal Industry by J. J. WHITEHEAD, President, Whitehead Metal Products Company of New York

The uncertainty surrounding the copper market during the last month, together with a well-defined downward tendence has developed a very cautious spirit on the part of the buyers. As a result of this, except in a few instances, business has been placed in very moderate volumes. The mills all continue to receive enough orders to keep them running, and as far as can be learned it has not been necessary to cut down any of the working forces. However, the present slim surplus of tonnage on the books, compared to the enormous volume of orders which the mills have had during the last several months, has developed a very strong feeling of anxiety on the part of the fabricators. There is very little copper being bought and sales are being made in comparatively small lots, with the result that the market continues to sag. There was another revision downward in brass and copper materials during the past month, so that prices are now on almost as low a basis as they were in the period of depression in 1921.

There is a feeling of hopefulness in the trade, that, during the coming month a reversal of sentiment will be noticed and another buying movement will be started. Stocks in the hands of dealers and manufacturers have run very low, and a return to anything like a normal buying basis would undoubtedly stimulate the demand to such an extent as to strengthen the entire market. Delivery of mill products can now be had on an average of from three to four weeks, with such items as brass rods and brass pipe available for shipment in about a week or ten days. It is very difficult to form any idea as to what the probable course of the market will be. Business in general, has of course, fallen off to some extent, but it seems to be a fact that the reaction in the brass and copper business has been much more acute than in other lines. This seems to be due to the feeling of uncertainty prevailing as to what the course of the copper market may be in the light of the chaotic European situation. There is a feeling that if the buying power of Europe were to be re-established so that they might be able to purchase the copper which they undoubtedly need, there would be a gradual upward movement in copper prices.

Contrary to the fluctuations of the brass and copper market above outlined, the price levels in Monel metal rolled forms are undisturbed and continue at figures which are regarded by the producer, the International Nickel Company, as fair to the consuming trade. These price levels are such, that, in the judgment of the distributing factors in this business, they will continue to provide increasing opportunity for expansion of the application of Monel metal.

It is important to note that after extensive experimentations malleable nickel in the forms of hot and cold rolled rods and sheets has been produced in satisfactory quality and that the Nickel Company's distributors will presently be in a position to offer this metal in rolled forms to the trade out of warehouse stocks located at convenient points of concentration of industry throughout the country.

Metal Market Review

Written for The Metal Industry by METAL MAN

COPPER

Demand for copper in August continued of restricted proportions, while prices displayed a weaker tendency, being influenced to a considerable extent by seasonal Summer dullness and the apathy of domestic buyers. Export sales, however, were in good volume and the aggregate business for foreign shipment last month made a particularly good showing in view of the unsettled European situation.

Producers made repeated cuts in price as the market for electrolytic gradually receded from 14½c to 13¾c. The majority of American manufacturers continued to refrain from specially large commitments. There were many inquiries and the interest of the trade from time to time was pronounced, but frequent market setbacks acted as a check upon important buying. However, there were moderate sales to consumers, and a marked revival of trading is expected wherever more favorable signs are in evidence. September opened with a weak market and buyers inclined to await further developments. Some business was taken at 13⅝c on a moderate quantity of electrolytic, but holders hesitate to go below those figures. There was less pressure to sell as we go to press, and a market rally would not be surprising.

ZINC

Domestic demand was notably dull recently, but foreign inquiries and substantial sales for export served to give the market a fairly firm tone. The heavy domestic consumption during the early months of the year was not maintained, and owing to the falling off in the home demand and accumulation of stocks in this country production was curtailed at several districts. Shipments consequently fell and the statistical position has improved to a considerable extent. Foreign buying assumed good proportions in the second half of August. London sent over heavy orders which gave the local market a measure of support, but domestic buying failed to broaden out. East St. Louis quotes 6.40c, 6.45c and New York 6.75c @ 6.80c.

TIN

A firmer and more active market developed in the last half of August. Prices in London made substantial gains and were in turn reflected by higher prices here and improved buying by domestic consumers. The course of the market recently was largely under the control of London operators, but foreign manipulations were characterized by considerable caution and with special regard to developments in the American market.

The unsettled condition of European affairs has acted as a brake on foreign traders taking a position which would prove too optimistic under present circumstances. Operators are not oblivious to the fact that the Far East has undigested supplies waiting for a favorable market. But London and Singapore are expecting a good American demand for another three or four months, and if this expectation is well-founded tin will probably command prices ranging from 38c to 41c for some time to come.

LEAD

On moderately increased demand prices of lead have moved up to 6¾c, New York basis as quoted by the American Smelting & Refining Co. The outside market is stronger, however, and prompt lead is quoting 7c to 7¼c. Consumers are taking more interest in the market, but inquiry is mostly for September delivery. Offerings are made with considerable reserve as producers are anticipating a large consumption in the Fall months. The statistical position is regarded as favorable to a firm market tone, and increased activity is expected to develop soon. Recent buying was fairly good during the last half of August. Stocks at eastern points are not considered large. Prices at East St. Louis quote 6.65c @ 6.75c. Outside market at New York is firm at 7.20c @ 7.25c. A firm and active market is anticipated in September and October.

ALUMINUM

Prices of imported aluminum have remained stationary for some time at 27c for 99% plus and 26½c for 98-99%. These prices could be shaded for resale lots. Quotations of the Aluminum Company are apparently matters of private concern only between producer and buyers. The rigidity or flexibility of the same are therefore left to the reader's imagination.

A Detroit company is undertaking the production of aluminum bars from deposits of alunite in Utah.

QUICKSILVER

Trading in quicksilver is quiet and prices have weakened to $62 to $63 per flask for spot goods, and $60 per flask was quoted for prompt shipment. Recent London cables quoted £8 10s.

PLATINUM

There is a very steady market for platinum at $116 per ounce. A recent discovery of a 30-mile reef of platinum is reported in the Transvaal. Imports for year ended June, 1923, were 90,521 troy ounces valued at $8,550,802, against imports for previous year of 75,269 ounces valued at $5,258,097.

SILVER

Recent current quotation for silver was 62¾c. With termination of purchases of silver by the United States under the Pittman Act at the fixed price of $1 an ounce there is but one quotation for the white metal. The proposal to organize a silver export association is not favorably regarded in British circles. They look upon it as an attempt to force buyers to pay an artificially high price. Supplies are large and the outlook for better prices is not encouraging. Imports of foreign silver into the United States in July were $10,066,463, against $6,065,947 in June. Total imports for first seven months of this year amounted to $39,098,825, as compared with exports of $31,493,706 for same period making excess of imports $7,605,119. The use of silver for coinage in Europe is on the decrease, and from present indications silver producers are facing a difficult situation.

ANTIMONY

Business in antimony has again become quiet and the market has relapsed into a state of pronounced dullness. There was a large business in Chinese regulus several weeks ago at lower figures than present quotations, but with demand largely satisfied sales have fallen off. Buyers are reluctant to pay current quotations for future shipments and the present outlook is for an easier tone to the market. Imports of metallic antimony into this country in 1922 amounted to 9,344 short tons, against 10,130 short tons in 1921. The world's peacetime consumption of antimony from ore produced, not including antimonial lead ores, is about 22,000 metric tons, and that of the United States 10,000 tons. Market on September 1st remained dull at 7½c duty paid for Chinese regulus 99%.

OLD METALS

The scrap metal market has been specially dull and narrow in movement for several weeks past. Buying has been light and a wide variance between the views of buyers and sellers exists which is difficult to bridge over. Some improvement is noted in scrap lead in sympathy with the firmer tendency for pig lead. Aluminum scraps are in good demand at prices recently current. All lines of old copper have felt the weakening developments which have set in lately in the market for new copper. Dealers are understood to be carrying large stocks of old metals for which there is a very restricted outlet at present. Prices dealers offered to pay at close of month were quoted at 11½c @ 12c for crucible copper, light copper 9¼c @ 9¾c, low brass clippings 8¼c @ 8¾c, aluminum clippings 17½c @ 18¼c, heavy lead 5½c @ 5¾c and old zinc scrap 4c @ 4¼c.

WATERBURY AVERAGE

Lake Copper—Average for 1922, 13.844—January, 1923, 14.875—February, 15.75—March, 17.25—April, 17.125—May, 16.125—June, 15.25—July, 15.00—August, 14.50.

Brass Mill Zinc—Average for 1922, 6.283—January, 1923, 8—February, 8—March, 8.70—April, 8.25—May, 7.60—June, 7.00—July, 6.80—August, 7.10.

Daily Metal Prices for the Month of August, 1923

Record of Daily, Highest, Lowest and Average

Metal Prices for September 7

Date	1	2	*3	6	7	8	9	*10	13	14	15	16	17	20
Copper (f. o. b. Ref.) c/lb. Duty Free														
Lake (Delivered)	14.875	14.75	....	14.75	14.75	14.75	14.75	....	14.50	14.375	14.375	14.375	14.375	14.375
Electrolytic	14.50	14.50	....	14.40	14.375	14.25	14.25	....	14.125	14.00	14.00	14.00	14.00	14.03
Casting	14.25	14.125	....	14.125	14.125	14.00	14.00	....	13.875	13.75	13.625	13.625	13.625	13.875
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.														
Prime Western	6.25	6.20	....	6.15	6.20	6.15	6.20	....	6.25	6.25	6.30	6.35	6.45	6.45
Brass Special	6.40	6.35	....	6.30	6.35	6.30	6.35	....	6.40	6.40	6.45	6.50	6.55	6.55
Tin (f. o. b., N. Y.) c/lb. Duty Free														
Straits	38.375	38.125	....	38.125	38.375	38.875	38.875	....	38.25	38.375	39.00	39.25	39.25	39.50
Pig 99%	37.875	37.625	....	37.625	37.875	38.375	38.50	....	37.875	37.875	38.50	38.625	38.625	38.875
Lead (f. o. b., St. L.) c/lb. Duty 2½c/lb.	6.65	6.65	....	6.55	6.50	6.45	6.45	....	6.45	6.45	6.45	6.40	6.45	6.45
Aluminum c/lb. Duty 5c/lb.	27.25	27.25	....	27.25	27.25	27.25	27.25	....	27.25	27.25	27.25	27.25	27.25	27.25
Nickel c/lb. Duty 3c/lb.														
Ingot—Internat. Nick. Co.	29	29	....	29	29	29	29	....	29	29	29	29	29	29
Outside Spot	28	28	....	28	28	28	28	....	28	28	28	28	28	28
Electrolytic (Internat. Nick. Co.)														
Ni.—99.80 contam. impur.—.14	32	32	....	32	32	32	32	....	32	32	32	32	32	32
Brit.-Amer. Nick. Corp.														
Ni.—98.50 contam. impur.—.80	30	30	....	30	30	30	30	....	30	30	30	30	30	30
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	7.80	7.80	....	7.70	7.70	7.75	7.75	....	7.875	7.875	7.875	7.75	7.75	7.625
Silver (foreign) c/oz. Duty Free	62.625	62.75	....	62.625	62.75	62.625	62.75	....	63.125	63.25	63.125	63.125	62.875	63.00
Platinum $/oz. Duty Free	116	116	....	116	116	116	116	....	116	116	116	116	116	116

Date	21	22	23	24	27	28	29	30	31	High	Low	Aver.	Sept. 7
Copper (f. o. b. Ref.) c/lb. Duty Free													
Lake (Delivered)	14.375	14.375	14.375	14.375	14.25	14.125	14.125	14.00	14.00	14.875	14.00	14.429	14.00
Electrolytic	14.00	14.00	14.125	14.00	14.00	13.90	13.75	13.70	13.70	14.50	13.70	14.077	13.80
Casting	13.875	13.85	13.85	13.80	13.75	13.75	13.60	13.50	13.50	14.25	13.50	13.832	13.625
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.													
Prime Western	6.50	6.50	6.50	6.50	6.45	6.45	6.45	6.45	6.45	6.50	6.15	6.355	6.55
Brass Special	6.60	6.65	6.65	6.65	6.55	6.55	6.55	6.55	6.55	6.65	6.30	6.486	6.65
Tin (f. o. b., N. Y.) o/lb. Duty Free													
Straits	39.50	40.00	40.125	39.875	40.375	40.625	40.75	40.875	40.625	40.875	38.125	39.387	42.125
Pig 99%	39.00	39.50	39.50	39.375	39.75	40.125	40.25	40.375	40.00	40.375	37.625	38.863	41.375
Lead (f. o. b., St. L.) c/lb. Duty 2½c/lb.	6.45	6.45	6.50	6.50	6.70	6.70	6.70	6.65	6.70	6.70	6.40	6.536	6.75
Aluminum c/lb. Duty 5c/lb.	27.00	27.00	27.00	27.00	26.50	26.50	26.50	26.50	26.50	27.25	26.50	27.024	26.50
Nickel c/lb. Duty 3c/lb.													
Ingot—Internat. Nick. Co.	29	29	29	29	29	29	29	29	29	29	29	29	29
Outside Spot	28	28	28	28	28	28	28	28	28	28	28	28	28
Electrolytic (Internat. Nick. Co.)													
Ni.—99.80 contam. impur.—.14	32	32	32	32	32	32	32	32	32	32	32	32	32
Brit.-Amer. Nick. Corp.													
Ni.—98.50 contam. impur.—.80	30	30	30	30	30	30	30	30	30	30	30	30	30
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	7.625	7.60	7.60	7.60	7.60	7.60	7.60	7.50	7.50	7.875	7.50	7.688	7.50
Silver (foreign) c/oz. Duty Free	62.875	62.75	62.50	62.25	62.625	62.50	62.875	62.75	62.75	63.25	62.25	62.786	62.75
Platinum $/oz. Duty Free	116	116	116	116	116	116	116	116	116	116	116	116	116

*No business.

Metal Prices, September 7, 1923

INGOT METALS AND ALLOYS

Brass Ingot, Yellow	9½to11½
Brass Ingots, Red	12½to14
Bronze Ingot	13½to15
Bismuth	$2.75
Cadmium	$1.00–1.05
Casting Aluminum Alloys	21 to24
Cobalt—97% pure	$2.75–3.00
Manganese Bronze Castings	22 to35
Manganese Bronze Ingots	13 to16
Manganese Bronze Forging	33 to42
Manganese Copper, 30%	28 to45
Magnesium Metal	$1.25–1.50
Parsons Manganese Bronze Ingots	18 to21
Phosphor Bronze	24 to30
Phosphor Copper, guaranteed 15%	18½to22
Phosphor Copper, guaranteed 10%	18 to21½
Phosphor Tin, guarantee 5%	48 to58
Phosphor Tin, no guarantee	48 to56
Quicksilver	$63–$64
Silicon Copper, 10%.....according to quantity	28 to35

OLD METALS

Buying Prices		Selling Prices
11¼to11½	Heavy Cut Copper	12½to13
10⅝to11	Copper Wire	12¼to12¾
9¼to 9½	Light Copper	10½to11
9 to 9½	Heavy Machine Comp	10¾to11¼
6¾to 7¼	Heavy Brass	8¾to 9¼
5 to 5¼	Light Brass	6¾to 7¼
6¼	No. 1 Yellow Brass Turnings	7¼to 8¼
8¼to 8¾	No. 1 Comp Turnings	9½to10
5¼to 5½	Heavy Lead	5¾to 6¼
2¼	Zinc Scrap	3¼to 3½
8¼to 8¾	Scrap Aluminum Turnings	10¾to11¼
14¼to14¾	Scrap Aluminum, cast alloyed	16¼to16¾
15¼to16¼	Scrap Aluminum, sheet (new)	17¼to18¼
22¼	No. 1 Pewter	26¼
13¾	Old Nickel anodes	15¼
21¼to23¼	Old Nickel	25¼to27¾

BRASS MATERIAL—MILL SHIPMENTS

In effect Aug. 22, 1923

To customers who buy 5,000 lbs. or more in one order.

	Net base per lb. High Brass	Low Brass	Bronze
Sheet	$0.18½	$0.20¼	$0.22
Wire	0.19	0.20¾	0.22½
Rod	0.16¾	0.21	0.22¾
Brazed tubing	0.26¼	.....	0.31¾
Open seam tubing	0.26½	.....	0.31¾
Angles and channels	0.29½	.....	0.34¾

To customers who buy less than 5,000 lbs. in one order

	Net base per lb. High Brass	Low Brass	Bronze
Sheet	$0.19½	$0.21¼	$0.23
Wire	0.20	0.21¾	0.23½
Rod	0.17¾	0.22	0.23¾
Brazed tubing	0.27½	.....	0.32¾
Open seam tubing	0.27½	.....	0.32¾
Angles and channels	0.30½	.....	0.35¾

SEAMLESS TUBING

Brass, 24c. to 25c. per lb. base.

Copper, 25½c. to 26½c. per lb. base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	20½c. net base
Muntz or Yellow Metal Sheathing (14"x48")	18½c. net base
Muntz or Yellow Rectangular Sheets other than Sheathing	19½c. net base
Muntz or Yellow Metal Rod	16½c. net base

Above are for 100 lbs. or more in one order.

COPPER SHEET

Mill shipments (hot rolled)	22¼c. to 23¼c.
From stock	23¼c. to 24¼c.

BARE COPPER WIRE—CARLOAD LOTS

16½c. to 16¾c. per lb. base.

SOLDERING COPPERS

300 lbs. and over in one order	20½c. per lb. base
100 lbs. to 200 lbs. in one order	21c. per lb. base

ZINC SHEET

Duty, sheet, 15%. Cents per lb.

Carload lots, standard sizes and gauges, at mill, 9¼c. basis less 8 per cent. discount.

Casks, jobbers' prices	11c. to 11¾c.
Open casks, jobbers' prices	11¾c. to 12¾c.

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga. and heavier, base price	37c.
Aluminum coils, 24 ga. and heavier, base price	35c.
Foreign	45c.

NICKEL SILVER (NICKELENE)

Base Prices

Grade "A" Nickel Silver Sheet Metal

10%	Quality	26c. per lb.
15%	"	27½c. per lb.
18%	"	28½c. per lb.

Nickel Silver Wire and Rod

10%	"	29c. per lb.
15%	"	32½c. per lb.
18%	"	35½c. per lb.

MONEL METAL

Shot	32
Blocks	32
Hot Rolled Rods (base)	40
Cold Drawn Rods (base)	48
Hot Rolled Sheets (base)	42

BLOCK TIN SHEET AND BRITANNIA METAL

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 10c. over Pig Tin. 40 to 100 lbs., 15c. over 25 to 50 lbs., 17c. over, less than 35 lbs., 25c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. or more, 10c. over Pig Tin. 50 to 100 lbs., 15c over, 25 to 50 lbs., 20c. over, less than 25 lbs., 25c. over. Above prices f. o. b. mill.

SILVER SHEET

Rolled silver anodes .999 fine are quoted at from 67c. to 69c. per Troy ounce, depending upon quantity.

Rolled sterling silver 64½c. to 66½c.

NICKEL ANODES

85 to 87% purity	31½c.-34c. per lb.
90 to 92% purity	34c.-35c. per lb.
95 to 97% purity	36c.-37c. per lb.

Supply Prices, September 7, 1923

CHEMICALS

In Commercial Quantities—New York Prices

Acetone	lb.	.24½–.27
Acid—		
Boric (Boracic) Crystals	lb.	.12
Hydrochloric (Muriatic) Tech., 20 deg., Carboys	lb.	.02
Hydrochloric, C. P., 20 deg., Carboys	lb.	.08
Hydrofluoric, 30%, bbls.	lb.	.08
Nitric, 36 deg. Carboys	lb.	.06
Nitric, 42 deg. Carboys	lb.	.07
Sulphuric, 66 deg. Carboys	lb.	.02
Alcohol—		
Butyl	lb.	.45-.50
Denatured in bbls.	gal.	.38–.45
Alum—		
Lump, Barrels	lb.	.04
Powdered, Barrels	lb.	.04½
Aluminum sulphate, commercial tech	lb.	.02½–.03
Aluminum chloride solution	lb.	.22
Ammonium—		
Sulphate, tech., Barrels	lb.	.03¾
Sulphocyanide	lb.	.65
Argols, white, see Cream of Tartar	lb.	.27
Arsenic, white, Kegs	lb.	.16
Asphaltum	lb.	.35
Benzol, pure	gal.	.60
Blue Vitriol, see Copper Sulphate.		
Borax Crystals (Sodium Biborate), Barrels	lb.	.06
Calcium Carbonate (Precipitated Chalk)	lb.	.04
Carbon Bisulphide, Drums	lb.	.07
Chrome Green, bbls.	lb.	.39¼
Cobalt Chloride	lb.	—
Copper—		
Acetate	lb.	.37
Carbonate, Barrels	lb.	.20
Cyanide	lb.	.46
Sulphate, Barrels	lb.	.06½
Copperas (Iron Sulphate, bbl.)	lb	.02
Corrosive Sublimate, see Mercury Bichloride.		
Cream of Tartar, Crystals (Potassium bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05–.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluor-spar (Calcic fluoride)	ton	$75.00
Fusel Oil	gal.	5.50
Gold Chloride	oz.	14.00
Gum—		
Sandarac	lb.	.26
Shellac	lb.	.59-.61
Iron, Sulphate, see Copperas, bbl	lb.	.02
Lead Acetate (Sugar of Lead)	lb.	.13
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	1.15
Nickel—		
Carbonate Dry	lb.	.40
Chloride, 100 lb. lots	lb.	.22½–.40
Salts, single, bbls	lb.	.11½
Salts, double, bbl	lb.	.10½
Parrafin	lb.	.05–.06
Phosphorus—Duty free, according to quantity		.35–.40
Potash, Caustic, Electrolytic 88-92% fused, drums	lb.	.09
Potassium Bichromate, casks	lb.	.11
Carbonate, 80-85%, casks	lb.	.06
Cyanide, 165 lb. cases, 94-96%	lb.	.65
Pumice, ground, bbls	lb.	.02½
Quartz, powdered	ton	$30.00
Official	oz.	—
Rosin, bbls.	lb.	.03½
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.08
Silver Chloride, dry	oz.	.86
Cyanide	oz.	—
Nitrate, 100 ounce lots	oz.	.46
Soda Ash, 58%, bbls	lb.	.02½
Sodium—		
Biborate, see Borax (Powdered), bbls	lb.	.06
Cyanide, 96 to 98%, 100 lbs	lb.	.23
Hyposulphite, kegs	lb.	.04
Nitrate, tech. bbls	lb.	.03
Phosphate, tech., bbls	lb.	.03¾
Silicate (Water Glass) bbls	lb.	.02
Sulpho Cyanide	lb.	.45
Soot, Calcined	lb.	—
Sugar of Lead, see Lead Acetate	lb.	.12–.13
Sulphur (Brimstone) bbls	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.32
Tripoli	lb.	.03
Verdigris, see Copper Acetate	lb.	.37
Water Glass, see Sodium Silicate, bbls	lb.	.02½
Wax—		
Bees, white ref. bleached	lb.	.55
Yellow, No. 1	lb.	.35
Whiting, Bolted	lb.	.02½–.06
Zinc, Carbonate, bbls	lb.	.13–.17
Chloride, 600 lb. lots	lb.	.07
Cyanide	lb.	.37
Sulphate, bbls.	lb.	.03¼

COTTON BUFFS

Open buffs, per 100 sections (nominal).

12 inch, 20 ply, 64/68, cloth	base,	38.75
14 inch, 20 ply, 64/68, cloth	base,	48.15
12 inch, 20 ply, 84/92, cloth	base,	45.00
14 inch, 20 ply, 84/92, cloth	base,	60.60
12 inch, 20 ply, 88/96, cloth	base,	48.65
14 inch, 20 ply, 88/96, cloth	base,	65.50
Sewed Buffs, per lb., bleached and unbleached	base,	.60

FELT WHEELS

		Price Per Lb. Less Than 100 Lbs.	300 Lbs. and Over
Diameter—10" to 16"	1" to 3"	2.75	2.50
" 6" 8" and over 16"	1" to 3"	2.85	2.60
" 6" to 24"	Over 3"	3.15	2.80
" 6" to 24"	½" to 1"	3.75	3.50
" 4" to 6"	¼" to 3"	4.75	Any quantity.
" Under 4"	¼" to 3"	5.35	

Grey Mexican or French Grey—10c. less per lb. than Spanish, above. Odd sizes, 50c. advance.